



# CHAPTER 7

## HAZARDS

### IN THIS CHAPTER

Wildfire Hazards | Seismic and Geologic Hazards | Flooding and Dam Inundation  
Drought | Other Climate-Related Hazards | Hazardous Material  
Airport Hazards | Emergency Preparedness



## 7.1 HAZARDS FINDINGS

### *Wildfire Hazards*

1. Areas vulnerable to intense and uncontrollable wildfires are present throughout Santa Rosa and Sonoma County. And the city has warmed 2.1 degrees Fahrenheit (°F) since 1895, and climate models forecast a future that is hotter and drier, producing more favorable conditions for fire ignition and spread.
2. Santa Rosa’s wildland-urban interface (WUI) encompasses approximately 30 percent of the city, which includes moderate, high, and very high wildfire hazard severity zones. The WUI boundary is anticipated to expand based on new mapping expected from the California Department of Forestry and Fire Protection (CAL FIRE).
3. Wildfire conditions can impact areas of the city due to embercast and smoke, which can exacerbate health conditions and fire threats in more urbanized areas of the city. Additional wildfire mitigation requirements for construction outside of the WUI may help to reduce or eliminate wildfire threats.
4. Accounting for more frequent and intense wildfire conditions in the future construction of buildings, roadways, and infrastructure can further ensure that future losses are minimized and recovery efforts are easier on those affected.
5. The City of Santa Rosa took swift action that reduced the potential cascading community consequences of the 2017 fires, notably: establishing an expedited rebuilding permit process with nearly 2,400 building permits issued as of August 2020; streamlining the City’s permitting process in prioritized areas to promote new housing development; undertaking a Downtown Station Area Specific Plan amendment process focused on adding density and housing in the downtown area; and obtaining voter approval of a 0.25-cent sales tax to support the rebuilding of City infrastructure. These measures are still in place and support ongoing efforts to rebuild fire losses.
6. An independent after-action review of the 2017 fires made 54 recommendations to improve the City’s capabilities in wildfire preparedness, response, and recovery, centered on five areas of improvement: situational assessment and information sharing; organization, staffing, and training; water system; transition to recovery and long-term recovery; and fire safety. The City is actively addressing all the recommendations, including those that require collaborative region-wide agency approaches.
7. State law requires that the General Plan Safety Element address the fire risk in State Responsibility Areas (SRAs) and very high fire-hazard severity zones in Local Responsibility Areas (LRAs)—both of which exist in Santa Rosa—and propose risk-reduction implementation measures that reduce the risk of fire.

8. In 2020, the City prepared a Community Wildfire Protection Plan (CWPP) that builds on the wildfire hazard analysis in the 2016 Local Hazard Mitigation Plan (LHMP) by providing a more detailed risk analysis and developing an action plan to address the wildfire threat to Santa Rosa. Broad stakeholder and community engagement in the planning effort included community workshops, a community survey with over 500 participants, and a robust schedule of agency/organization meetings. The plan was presented to City Council as a report item on August 25, 2020 and was unanimously approved. The CWPP is intended to be added to the LHMP, making it integral to the City's Safety Element. The approved CWPP action plan will be reflected in the City's Safety Element and other relevant elements of the updated General Plan.

### *Seismic and Geologic Hazards*

9. Earthquake and geologic hazards are an important consideration for all future development and redevelopment opportunities within the city, given the proximity to the Rodgers Creek Fault, and the potential expansion of the Alquist-Priolo Special Study Zone expected in 2021.
10. Although Santa Rosa has not experienced a damaging earthquake since 1969, there is a very high likelihood (72 percent probability) that Santa Rosa will experience damaging ground motions from an earthquake occurrence in the San Francisco Bay region during the period covered by the General Plan Update.
11. The underlying geology within the Santa Rosa Plain (beneath the flatland areas of the city) can trap and amplify seismic waves, intensifying ground shaking. Such amplification explains why Santa Rosa sustained heavy damage from both the great 1906 earthquake and two relatively moderate earthquakes in 1969, and it also means that Santa Rosa could experience very strong shaking in a future earthquake on the Rodgers Creek Fault.
12. Fires occur following all earthquakes that significantly shake the built environment, but they are generally only a significant problem in urban areas predominantly composed of densely developed wood-framed buildings. Major mitigating factors to reduce the risk of earthquake induced fires include ensuring older wood-framed structures are adequately secured to their foundations, automatic gas shutoff valves are installed, water supply systems are resilient to earthquake hazards, and an auxiliary water supply for firefighting is in place.
13. Liquefaction and earthquake-generated landslide risks exist throughout Santa Rosa even though the California Geological Survey has not yet mapped these state seismic hazard regulatory zones in Sonoma County.

14. Wildfires in areas of steep topography can exacerbate slope instability and increase the risk of landslides and mudflows that can have devastating impacts both in immediate areas and downslope. Mitigating measures, including downslope protections, can help reduce landslide and mudflow related risk, as part of future development and redevelopment in areas prone to wildfire hazards.
15. The city is vulnerable to both earthquake- and rainfall-induced landslides. Areas surrounding Santa Rosa and Spring Creeks, Santa Rosa Flood Control Channel, and areas on steeper hillslopes are vulnerable to earthquake-induced landslide and susceptible to liquefaction. Santa Rosa has experienced rainfall-induced landslides in the past, ranging from small, localized events to larger events that caused injury and substantial damage. Decreased vegetation from wildfires can combine with excessive ground moisture from heavy rains to cause landslides.
16. The interaction of wildfire events in areas of steep topography can exacerbate slope stability issues in areas already prone to landslides. Understanding existing landslide hazard areas and the intersection of fire conditions will support safe and sustainable future development/redevelopment in the city.

#### *Flooding and Dam Inundation*

17. Flooding in the low-lying areas of Santa Rosa (southwest of US Highway 101) can impact key critical facilities associated with sewer treatment. Development activities in the city that could increase runoff could increase flooding in this area, making these facilities more prone to flooding.
18. Drainage improvements and enhancements, that do not increase wildfire vulnerability, are needed along creeks in the city to increase drainage capacity and support habitat restoration.
19. The General Plan Update offers an opportunity for the City to explore a variety of measures that can minimize the risk of flooding and dam inundation, which could include the following.
  - a. Increase coordination and collaboration with dam owners/operators regarding dam maintenance and upgrades to ensure downstream impacts are better understood, and risks to properties susceptible to inundation are effectively managed.
  - b. Integrate additional capacity into future stormwater infrastructure upgrades to accommodate variability resulting from climate change.
  - c. Assess storm drain materials for vulnerability to hazards (wildfire, earthquake, etc.) and design upgrades/retrofits from materials that require less maintenance and upkeep wherever possible.

- d. Increase the use of natural drainage strategies within areas identified for creek restoration, with the focus of minimizing development encroachment and reducing maintenance costs.
- e. Develop flood-control measures that integrate with the reconstruction process in wildfire-impacted areas.

### *Drought*

- 20. Water supplies in the region rely on surface water from the Russian River Watershed, which may experience drought conditions in the future. This strain on future water supplies can be mitigated through the development of new water supplies that are more resilient to drought conditions. The General Plan Update can identify opportunities to protect water sources through future developments and improvements within the city, including supporting groundwater recharge through impervious standards for development.
- 21. Future water supply constraints can be reduced through effective water demand management and improvements to monitoring activities of both the water system infrastructure and water supplies entering the system. Additionally, existing water supply constraints can be reduced through water reclamation.
- 22. Reduction of water usage/demand focused on landscaping and vegetation types that can adapt to changes in precipitation and temperature can yield significant water savings for landscaping uses, which often account for a majority of water demand in drier climates.

### *Hazardous Materials*

- 23. A variety of locations within the city (e.g., dry cleaners and automotive repair shops) use, store, manufacture, and dispose of hazardous materials. The city also has a variety of industrial facilities that contain significant quantities of hazardous materials. Through the General Plan Update, the City can enhance safety measures surrounding hazardous materials by considering implementation of any of the following measures:
  - a. Monitoring and tracking hazardous materials within the city in correspondence with mapped hazard zones to gain a better understanding of which areas of the city may be impacted by releases as a secondary effect of a hazard event.
  - b. Prioritizing safe hazardous waste transport routes within the city and modifying critical facilities and infrastructure along these routes to reduce the threat of hazardous material spills.

- c. Expanding the understanding of the use, handling, storage, generation, and disposal of hazardous materials through other City departments to ensure these locations are better understood and evaluated as part of City activities.
- d. Considering retrofit incentives for structures that contain hazardous materials or are at risk of exposing hazardous materials.
- e. Tracking new and emerging trends in hazardous materials and contamination to ensure future impacts do not create hardships—this is primarily a concern with groundwater resources and changing regulations.

#### *Airport Hazards*

- 24. As the largest airport facility within the North Bay Area, Sonoma County Airport is a significant asset to the regional emergency response and preparedness efforts.
- 25. Expansion of the airport may conflict with existing and future uses within the northern portions of the city.
- 26. The General Plan Update can seek opportunities to collaborate with Sonoma County Airport to support its sustainable future by focusing on increasing resilience and identifying changing flood and fire conditions that may impact airport facilities and operations.

#### *Emergency Preparedness*

- 27. Wildfire and earthquake hazards are the most prevalent hazards in and around Santa Rosa, making these the most important hazards to consider in emergency planning.
- 28. Evacuation routes are clearly defined; however, evacuation planning could be improved by an assessment of the hazards and constraints to these routes and consideration of evacuation routes as part of the Capital Improvement Program, allowing for prioritization of improvements along these roadways to enhance resilience.

## 7.2 INTRODUCTION

Since the Santa Rosa General Plan 2035 was completed in 2009, the City has reviewed and strengthened its goals and policies on managing hazards as part of two local hazard mitigation planning efforts. In 2012, the City adopted the 2010 LHMP Annex to the Association of Bay Area Governments (ABAG) Taming Natural Disasters. The City prepared an update to this LHMP in 2016, which was adopted in 2017 by City Council.

This chapter identifies existing conditions in Santa Rosa related to hazards present in the city as well as hazard mitigation and emergency preparedness. Relevant hazards from the 2016 LHMP are discussed in this chapter along with other issues that have emerged from new research or changing conditions. This Chapter is divided into the following sections:

- Hazards Findings (Section 7.1)
- Introduction (Section 7.2)
- Regulatory Framework (Section 7.3)
- Wildfire Hazards (Section 7.4)
- Seismic and Geologic Hazards (Section 7.5)
- Flooding and Dam Inundation (Section 7.6)
- Drought (Section 7.7)
- Other Climate-Related Hazards (Section 7.8)
- Hazardous Materials (Section 7.9)
- Airport Hazards (Section 7.10)
- Emergency Preparedness (Section 7.11)
- Sources (Section 7.12)

The protection of human life is the highest priority for all hazard mitigation efforts. The 2020 estimated population of Santa Rosa is 181,038, with higher population densities in the central and western areas of the city. **Table 7-1** identifies vulnerable populations within the city, in the following population types: with incomes below the poverty level, populations with disabilities, and populations that are 65 years and older. Additional populations may also face greater susceptibility to hazard concerns and are listed in **Table 7-1**.

Potentially Vulnerable Population Groups	Percent (%) of Total City Population or Households
Population under 18 years old	22.1
Population under 65 years old with one or more disabilities	8.3
Population 65 years and older	16.1
Families/individuals whose income is below the poverty level	11.5
Disabled population (with hearing, vision, cognitive, ambulatory, self-care, and independent living difficulties)	12.1
Households with language other than English spoken at home	32.0
Population identifying as non-white	22.2
Population without a high-school diploma or higher-education level	14.3
Source: <a href="#">Santa Rosa City Profile, U.S. Census, 2020</a>	

The Metropolitan Transportation Commission (MTC) “communities of concern” designation methodology uses U.S. Census American Community Survey data to identify eight census tract-level variables that are known indicators of socially and economically vulnerable populations. Specifically, communities of concern are defined as census tract areas with a concentration of both minority and low-income residents, or areas with a concentration of low-income residents and any three or more of the following six factors: Persons with limited English proficiency, zero-vehicle households, seniors aged 75 years and over, persons with one or more disability, single-parent families, and renters paying more than 50 percent of their household income on housing.

**Figure 7-1** illustrates the community of concern area in Santa Rosa, which is bisected by Highway 101. The east side of the area encompasses much of the central business district (roughly bounded by College Avenue on the north, Broadway Avenue on the east, and Highway 12 to the south). The west side of the area encompasses the recently annexed Roseland community and is roughly bounded by Piner Road to the north, Stony Point Road to the west, and Bellevue Avenue to the south.

The protection of property and resulting cascading social and economic impacts stemming from widespread property damage are concerns for the City. With a mix of structure types and ages across the city, future hazards may impact parts of the city differently based on the age of the structure and adherence to the codes at the time of construction.

**Table 7-2** identifies 180 critical facilities from the 2016 LHMP that are essential to providing basic services and supporting community functions, especially following a hazard event. These facilities include fire stations, hospitals, water/wastewater conveyance and treatment facilities, and dams.

Table 7-2: City of Santa Rosa Critical Infrastructure Summary	
Facility Type	Number of Facilities
City	16
Fire	12
Government Center	4
Health and Hospitals	12
Schools	58
Utilities	78
Source: City of Santa Rosa Local Hazard Mitigation Plan, 2016	

In addition to the critical infrastructure identified throughout the city, evacuation routes have also been identified throughout the city to assist with future evacuation needs. These routes have been organized into Evacuation Planning Areas that identify the key routes to be used. Section 7.11 includes a discussion of these routes.

Section 7.3 includes a discussion of the regulatory framework that governs addressing hazards within the General Plan. Sections 7.4 through 7.10 include elements of each hazard category reviewed in greater detail, considering both the history and future risk of the hazards as well as the implications for the General Plan. Section 7.11 includes information on emergency preparedness and Section 7.12 lists sources cited in this chapter.

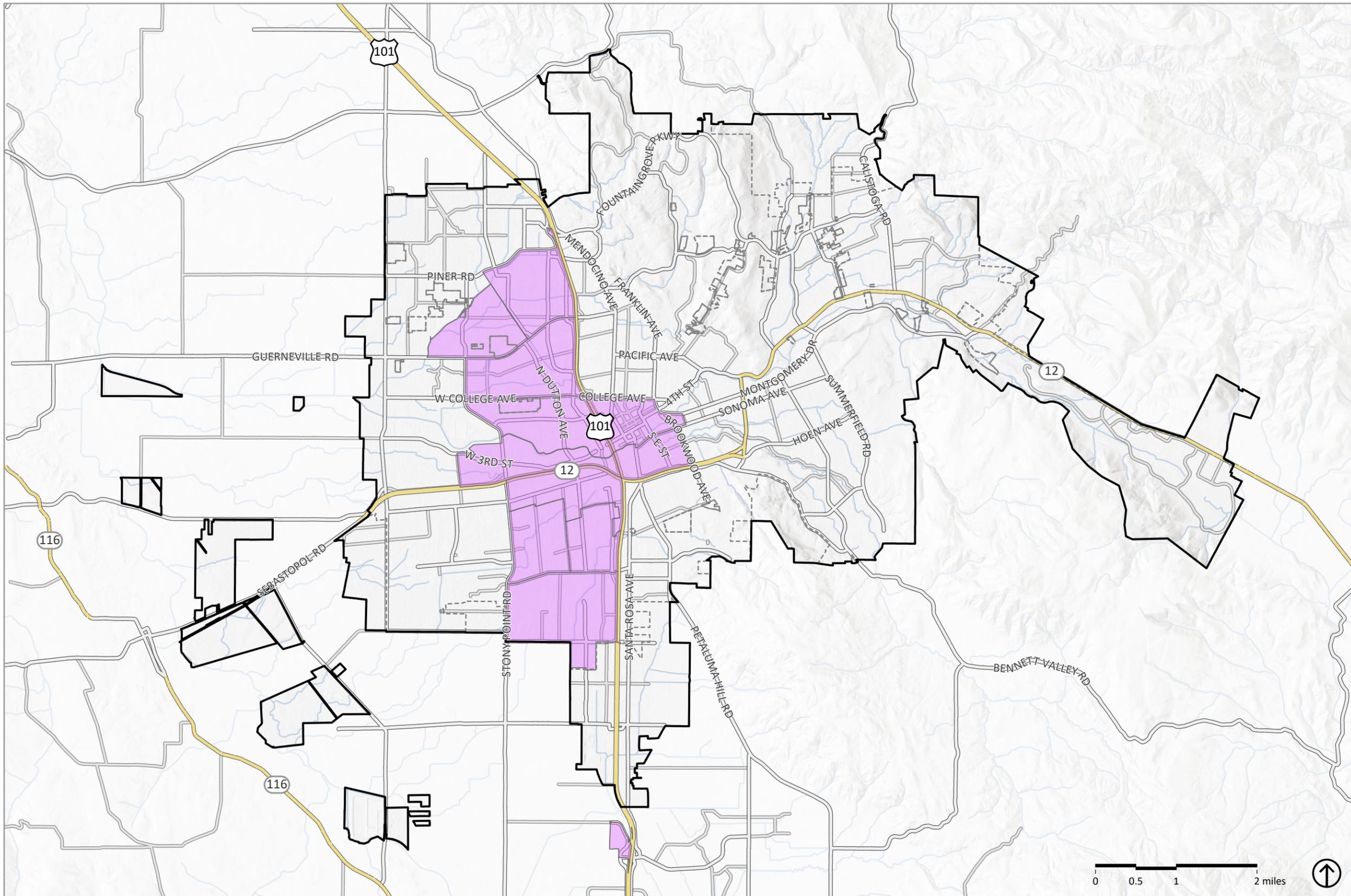


Figure 7-1  
**Communities of Concern**

- Communities of Concern Class
- High
  - Higher
  - Highest
  - Planning Area
  - City Limit

## 7.3 REGULATORY FRAMEWORK

### Federal Regulations

#### *National Flood Insurance Program*

The Federal Emergency Management Agency (FEMA) administers the NFIP, which provides subsidized flood insurance to communities that comply with FEMA regulations, which limit development in flood plains (FEMA 2020). FEMA also issues Flood Insurance Rate Maps (FIRMs) that identify which land areas are subject to flooding. These maps provide flood information and identify flood hazard zones in the community.

#### *United States Environmental Protection Agency*

The United States Environmental Protection Agency (USEPA) is the primary federal agency that regulates hazardous materials and waste. In general, the USEPA works to develop and enforce regulations that implement environmental laws enacted by Congress. The agency is responsible for researching and setting national standards for a variety of environmental programs and delegates the responsibility for issuing permits and for monitoring and enforcing compliance to states and Native American tribes. USEPA programs promote handling hazardous wastes safely, cleaning up contaminated land, and reducing waste volumes through such strategies as recycling. California falls under the jurisdiction of USEPA Region 9.

#### *United States Department of Transportation*

The United States Department of Transportation (USDOT) has the regulatory responsibility for the safe transportation of hazardous materials between states and to foreign countries. The federal Resource Conservation and Recovery Act (RCRA) of 1976 (described below) imposes additional standards for the transport of hazardous wastes.

#### *Occupational Safety and Health Administration*

The Occupational Safety and Health Administration (OSHA) oversees the administration of the Occupational Safety and Health Act, which requires specific training for hazardous materials handlers, provision of information to employees who may be exposed to hazardous materials, and acquisition of material safety data sheets from materials manufacturers. The material safety data sheets describe the risks, as well as proper handling and procedures, related to hazardous materials. Employee training must include response and remediation procedures for hazardous materials releases and exposures.

#### *Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984*

Federal hazardous waste laws are generally promulgated under the RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984. These laws provide for the “cradle to grave” regulation of hazardous wastes. Any business, institution, or other entity that generates hazardous waste is required to identify and track its hazardous waste from the point of generation until it is recycled, reused, or disposed. Under the Certified Unified Program Agency

(CUPA) program, California Environmental Protection Agency (CalEPA) has in turn delegated enforcement authority to Sonoma County for State law regulating hazardous waste producers or generators in Santa Rosa.

***Comprehensive Environmental Response, Compensation, and Liability Act and the Superfund Amendments and Reauthorization Act of 1986***

Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as “Superfund,” on December 11, 1980. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at these sites, and established a trust fund to provide for cleanup when no responsible party could be identified. The Superfund Amendments and Reauthorization Act (SARA) amended the CERCLA on October 17, 1986. SARA stressed the importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites, required Superfund actions to consider the standards and requirements found in other State and federal environmental laws and regulations, provided new enforcement authorities and settlement tools, increased state involvement in every phase of the Superfund program, increased the focus on human health problems posed by hazardous waste sites, encouraged greater citizen participation in making decisions on how sites should be cleaned up, and increased the size of the trust fund to \$8.5 billion.

***Emergency Planning Community Right-to-Know Act***

The Emergency Planning Community Right-to-Know Act (EPCRA), also known as SARA Title III, was enacted in October 1986. This law requires state and local governments to plan for chemical emergencies. Reported information is then made publicly available so that interested parties may become informed about potentially dangerous chemicals in their community. In California, SARA Title III is implemented through California Accidental Release Program (CalARP). The State of California has delegated local oversight authority of CalARP to Sonoma County.

***Hazardous Materials Transportation Act***

The USDOT regulates hazardous materials transportation under Title 49 of the Code of Federal Regulations (CFR). State agencies that have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). The California State Fire Marshal’s Office has oversight authority for hazardous materials liquid pipelines. The California Public Utilities Commission (CPUC) has oversight authority for natural gas pipelines in California. These agencies also govern permitting for hazardous materials transportation.

### ***Federal Response Plan***

The Federal Response Plan of 1999 is a signed agreement among 27 federal departments and agencies and other resource providers, that: (1) provides the mechanism for coordinating delivery of federal assistance and resources to augment efforts of state and local governments overwhelmed by a major disaster or emergency; (2) supports implementation of the Robert T. Stafford Disaster Relief and Emergency Act, as well as individual agency statutory authorities; and (3) supplements other federal emergency operations plans developed to address specific hazards.

### ***The Stafford Act***

The *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act) of 1988 authorizes federal government assistance for emergencies and disasters when state and local capabilities are exceeded. The Stafford Act forms the statutory authority for most federal disaster response activities, especially as they relate to the Federal Emergency Management Agency (FEMA) and FEMA programs.

### ***National Response Framework***

The 2013 *National Response Framework*, published by the Department of Homeland Security, is a guide for the nation to respond to all types of disasters and emergencies. The *National Response Framework* describes specific authorities and best practices for managing incidents that range from serious local or large-scale terrorist attacks or catastrophic natural disasters. In addition, the *National Response Framework* describes the principles, roles, and responsibilities, and coordinating structures for responding to an incident, and further describes how response efforts integrate with those of the other mission areas.

### ***Federal Emergency Management Agency***

The FEMA, an agency of the United States Department of Homeland Security, was established in 1978 to lead the United States in the preparation for, prevention of, response to, and recovery from, disasters that overwhelm the resources of a local or state jurisdiction. FEMA is largely involved with local and state jurisdictions after a disaster, in which case a governor of a state declares a state of emergency that formally requests federal assistance. FEMA administers several strategic and operational planning programs to prepare groups to manage the entire life cycle of a crisis or disaster.

## **State**

### ***Alquist-Priolo Earthquake Fault Zoning Act***

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture to structures used for human occupancy. The main purpose of this act is to prevent the construction of buildings used for human occupancy on top of active faults. This act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as earthquake-induced liquefaction or landslides (CGS 2020). This act requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around surface traces of active faults, and to issue appropriate maps (CGS 2020). The

maps, which are developed using existing United States Geological Survey's 7.5-minute quadrangle map bases, are then distributed to all affected cities, counties, and State agencies for their use in planning and controlling new or renewed construction. Generally, construction within 50 feet of an active fault zone is prohibited.

### *Seismic Hazards Mapping Act*

The 1990 *Seismic Hazards Mapping Act* addresses seismic hazards such as liquefaction and seismically induced landslides (CGS 2020). Under this act, seismic hazard zones are mapped by the State Geologist to assist local governments in land use planning. Section 2691(c) of this act states that "it is necessary to identify and map seismic hazard zones in order for cities and counties to adequately prepare the safety element of their general plans and to encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety." Section 2697(a) of the act states that, "cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard" (California Public Resources Code, Division 2, Chapter 7.8, Section 2697[a]).

### *California Building Code*

The State of California provides a minimum standard for building design through Title 24 of the California Code of Regulations (CCR), commonly referred to as the California Building Code (CBC). CBC is in Part 2 of Title 24 of the CCR. CBC is updated every three years. It is generally adopted on a jurisdiction-by-jurisdiction basis, subject to further modification based on local conditions. The City regularly adopts each new CBC update under the Santa Rosa City Code Title 18, Buildings and Construction, Chapter 18-16, California Building Code. Through CBC, the State provides a minimum standard for building design and construction. CBC contains specific requirements for seismic safety, foundations, and retaining walls, among other requirements.

Chapter 7A of the CBC, Materials and Methods for Exterior Wildfire Exposure, prescribes building materials and construction methods for new buildings in a Fire Hazard Severity Zone. Chapter 7A contains requirements for roofing; attic ventilation; exterior walls; exterior windows and glazing; exterior doors; decking; protection of underfloor, appendages, and floor projections; and ancillary structures.

### *Senate Bill 606*

Senate Bill (SB) 606, adopted in 2018, requires that the state of California achieve a 20-percent reduction in urban per-capita water use by December 31, 2020, and continues to monitor water consumption to reduce the severity of future sustained drought events. SB 606 requires that an urban retail water supplier calculates their water use objective by November 1, 2023, to be revised annually, which discloses the annual water consumption of each water supply retailer. The State is permitted, per SB 606, to then produce conservation orders to urban water supply retailers that do not meet the State's urban water use objective. SB 606 further allows for the State to impose civil liability for a violation of an order or regulation issued pursuant to SB 606.

### ***Assembly Bill 1668***

Assembly Bill (AB) 1668, adopted in conjunction with SB 606 in 2018, requires the State Water Resources Control Board (SWRCB), in coordination with the Department of Water Resources, to adopt long-term standards for the efficient use of water. AB 1668 additionally requires the SWRCB to adopt performance measures to track conservation efforts and conduct necessary studies and investigations. AB 1668, like SB 606, allows for the State to impose civil liability for a violation of an order or regulation issued pursuant to AB 1668.

### ***California Environmental Protection Agency***

One of the primary State agencies that regulate hazardous materials is the CalEPA. CalEPA is authorized by the USEPA to enforce and implement certain federal hazardous materials laws and regulations. The California Department of Toxic Substances Control (DTSC), a department of the CalEPA, protects California and its citizens from exposure to hazardous waste, primarily under the authority of the RCRA and the California Health and Safety Code (Section 25100 et seq. and Section 25300 et seq.). The DTSC programs include dealing with aftermath clean-ups of improper hazardous waste management; evaluation of samples taken from sites; enforcement of regulations regarding use, storage, and disposal of hazardous materials; and encouragement of pollution prevention.

### ***California Division of Occupational Safety and Health***

Like OSHA at the federal level, the California Division of Occupational Safety and Health (CalOSHA) is the responsible State-level agency for ensuring workplace safety. CalOSHA assumes primary responsibility for the adoption and enforcement of standards regarding workplace safety and safety practices. If a work site is contaminated, a Site Safety Plan must be crafted and implemented to protect the safety of workers. Site Safety Plans establish policies, practices, and procedures to prevent the exposure of workers and members of the public to hazardous materials originating from the contaminated site or building.

### ***California Department of Forestry and Fire Protection***

CAL FIRE has mapped fire threat potential throughout California. CAL FIRE ranks fire threat based on the availability of fuel and the likelihood of an area burning based on topography, fire history, and climate. The rankings include no fire threat, moderate, high, and very high fire threat. Additionally, CAL FIRE published the *2010 Strategic Fire Plan for California*, which contains goals, objectives, and policies to prepare for and mitigate for the effects of fire on California's natural and built environments (CAL FIRE 2019).

### ***California Department of Transportation and California Highway Patrol***

The California Department of Transportation (Caltrans) and California Highway Patrol (CHP) are the two State agencies that have primary responsibility for enforcing federal and State regulations and responding to hazardous materials transportation emergencies. Caltrans manages California's highways and freeways, provides intercity rail services, permits more than 400 public-use airports and special-use hospital heliports, and works with local agencies. Caltrans is also the first responder for hazardous material spills and releases that occur on highways, freeways, and intercity rail lines.

The CHP enforces hazardous materials and hazardous waste labeling and packing regulations designed to prevent leakage and spills of materials in transit and to provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP, which conducts regular inspections of licensed transporters to assure regulatory compliance. In addition, the State of California regulates the transportation of hazardous waste originating or passing through the state.

#### *California Health and Safety Code and Code of Regulations*

California Health and Safety Code Chapter 6.95 and CCR Title 19, Section 2729, set out the minimum requirements for business emergency plans and chemical inventory reporting. These regulations require businesses to provide emergency response plans and procedures, training program information, and a hazardous material chemical inventory disclosing hazardous materials stored, used, or handled on-site. A business that uses hazardous materials or a mixture containing hazardous materials, must establish and implement a business plan if the hazardous material is handled in certain quantities.

#### *California Education Code*

The California Education Code (CEC) establishes the law for California public education. The CEC requires that the DTSC be involved in the environmental review process for the proposed acquisition and/or construction of school properties that will use State funding. The CEC requires that a Phase I Environmental Site Assessment be completed prior to acquiring a school site or engaging in school construction. Depending on the findings of the Phase I assessment, further site assessment and/or remediation may be necessary. The CEC also requires potential, future school sites that are proposed within two miles of an airport to be reviewed by the Caltrans Division of Aeronautics.

#### *Fire Hazard Severity Zones and Responsibility Areas*

CAL FIRE publishes maps recommending fire hazard severity zones for every California county. The maps identify lands in California as falling within one of the following management areas: LRA, SRA, and Federal Responsibility Area (FRA). Within each of these areas, a single agency has direct responsibility: in LRAs, local fire departments or fire protection districts are responsible; in SRAs, CAL FIRE is responsible; in FRAs, federal agencies such as the United States Forest Service, National Park Service, Bureau of Land Management, United States Department of Defense, United States Fish and Wildlife Service, and Department of the Interior are responsible (ABAG and MTS 2018). Within the LRA, CAL FIRE designates lands as being within a Very High Fire Hazard Severity Zone (VHFHSZ) or non-VHFHSZ.

#### *California Fire Code*

The California Fire Code (CFC) incorporates, by adoption, the International Fire Code of the International Code Council, with California amendments. This is the official Fire Code for the state and all political subdivisions. It is found in CCR, Title 24, Part 9, and, like the CBC, it is revised and published every three years by the California Building Standards Commission. Also like the CBC, the CFC is effective statewide, but a local jurisdiction may adopt more restrictive standards based on local conditions. The City regularly adopts each new Fire Code update under the Santa Rosa

City Code (SRCC) Title 18, Buildings and Construction. The CFC includes provisions and standards for emergency planning and preparedness, fire service features, fire protection systems, hazardous materials, fire flow requirements, and fire hydrant locations and distribution. Typical fire safety requirements include installation of sprinklers in all high-rise buildings; the establishment of fire resistance standards for fire doors, building materials, and particular types of construction; and the clearance of debris and vegetation within a prescribed distance from occupied structures in wildfire hazard areas.

### *Wildland-Urban Interface Areas*

Chapter 49 of the CFC, Requirements for WUI Fire Areas, prescribes construction materials and methods in fire hazard severity zones; requirements generally parallel CBC, Chapter 7A.

### *Defensible Space*

California Public Resources Code Sections 4291 et seq. requires that brush, flammable vegetation, or combustible growth within 100 feet be removed – around all buildings on or adjoining a mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or land covered in flammable materials. Requirements regarding hazardous vegetation and fuel management are also contained in Sections 4906 and 4907 of the CFC.

### *California Office of Emergency Services*

The California Office of Emergency Services (Cal OES) was established on January 1, 2009, and created by AB 38, which merged the duties, powers, purposes, and responsibilities of the former Cal OES with those of the Governor’s Office of Homeland Security. Cal OES is responsible for the coordination of overall State agency response to major disasters in support of local government. Cal OES is responsible for ensuring the State’s readiness to respond to and recover from all hazards—natural, humanmade, emergencies, and disasters—and for assisting local governments in their emergency preparedness, response, recovery, and hazard mitigation efforts. In 2018, Cal OES completed a *State Hazard Mitigation Plan*, which designated fire hazard severity zones and WUI areas (Cal OES 2018).

### *2019 Strategic Fire Plan for California*

CAL FIRE produced the 2019 *Strategic Fire Plan for California*, which contains goals, objectives, and policies to prepare for and mitigate for the effects of fire on California’s natural and built environments (CAL FIRE 2019). The 2019 *Strategic Fire Plan for California*, focuses on fire prevention and suppression activities to protect lives, property, and ecosystems; in addition to providing natural resource management to maintain State forests as a resilient carbon sink to meet California’s climate change goals. This plan provides State Responsibility Fire Safe Regulations, which requires that all parcels 1 acre or larger provide a minimum 30-foot setback for buildings from all property lines and/or the center of the road. A key component of the 2019 *Strategic Fire Plan for California* is the collaboration between communities to ensure fire suppression and natural resource management is successful (CAL FIRE 2019).

### *California Public Utilities Commission*

In 2007, wildfires in Southern California were ignited by overhead utility power lines and aerial communication facilities near power lines. In response, the CPUC began considering and adopting regulations to protect the public from fire hazards due to overhead power lines and nearby aerial communication facilities. The CPUC published a Fire-Threat Map under Rulemaking 15-05-006, following procedures in Decision 17-01-009, revised by Decision 17-06-024, which adopted a work plan for the development of a utility High Fire-Threat District where enhanced fire safety regulations in Decision 17-12-024 apply (CPUC 2020a). The fire regulations require electric utilities to (CPUC 2020b):

- Prioritize the correction of safety hazards.
- Correct non-immediate fire risks in “Tier 2” (elevated fire threat) areas on the CPUC High Fire-Threat District within 12 months, and in “Tier 3” (extreme fire threat) areas within 6 months.
- Maintain increased clearances between vegetation and power lines within the High Fire-Threat District.
- Maintain stricter wire-to-wire clearances for new and reconstructed facilities in Tier 3 areas.
- Conduct annual inspections of overhead distribution facilities in rural areas of Tier 2 and Tier 3 areas.
- Prepare a fire prevention plan annually if overhead facilities exist in the High Fire-Threat District.

### *California State Aeronautics Act*

The *State Aeronautics Act* is implemented by the Caltrans Division of Aeronautics. The purpose of this act is to: (1) foster and promote safety in aeronautics; (2) ensure State laws and regulations relating to aeronautics are consistent with federal aeronautics laws and regulations; (3) ensure that persons residing near airports are protected against unreasonable levels of aircraft noise; and (4) develop informational programs to increase the understanding of current air transportation issues.

### *Assembly Bill 32*

AB 32, otherwise known as the Global Warming Solutions Act of 2006, was adopted into State law as a comprehensive program to reduce greenhouse gas (GHG) emissions from all sources throughout the state. This legislation makes the California Air Resources Board (CARB) the agency responsible for implementing AB 32 and coordinating the State’s GHG-reduction efforts. AB 32 requires CARB to take market-based and regulatory actions to reduce GHG emissions in the state to 1990 levels by 2020. The strategies to reach this goal are outlined in the AB 32 Scoping Plan, developed by CARB. These strategies come from virtually all sectors of the economy and are implemented through a comprehensive set of policies, planning, regulations, incentives, and voluntary efforts. The Scoping Plan, which was updated in 2014 and 2017, also identifies local

governments as key partners in the state’s GHG reduction efforts and identifies a target of 15 percent below 2005–2008 GHG levels as being comparable to 1990 levels for local efforts.

### ***Executive Order B-30-15***

Executive Order (EO) B-30-15 was signed by Governor Brown in 2015 to establish an interim GHG emissions reduction target of 40 percent below 1990 levels by 2030. EO B-30-15 directed State agencies to take additional steps to prepare for the impacts of climate change. EO B-30-15 additionally required that climate change impacts be assessed in the state’s Infrastructure Investment Plan and be considered in all state planning and investment decisions.

### ***Senate Bill 32***

SB 32 was adopted in 2016 to extend the mandate of AB 32, requiring the state to reduce GHG emissions to 40 percent below 1990 levels by 2030. SB 32 was adopted to incorporate aspects of EO B-30-15 into State legislation, both of which introduce longer-term targets for GHG emission reduction. While AB 32 established a target of returning GHG emissions to 1990 levels by 2020, EO B-30-15 and SB 32 set a target of reducing emissions 40 percent below 1990 levels by 2030. SB 32 is strictly an enforcement of GHG emission reduction and does not prescribe the strategies to do so, which continue to be outlined by CARB in the AB 32 Scoping Plan.

### ***Senate Bill 379***

SB 379, adopted in 2016, requires all cities and counties in the state to include climate adaptation and resiliency strategies in the safety elements of their general plans. These sections are required to include goals, policies, and objectives for their communities based on a vulnerability assessment or an LHMP.

### ***California Adaptation Planning Guide***

The Cal OES prepared the Adaptation Planning Guide (APG) to establish a system of guidance and support for local governments as they implement strategies to address the consequences of climate change. The APG sets the foundation for climate change adaptation planning and details in a step-by-step process for vulnerability assessments and adaptation strategy development for jurisdictions who do not have the capacity to pursue them separately. The APG provides options that allow jurisdictions to remain flexible in implementing strategies to reduce GHG emissions to cater to their time, financial, and scope needs. The APG was first adopted in 2012, and a revised version was prepared in 2020.

### ***Safeguarding California***

The Safeguarding California Plan is part of California’s Climate Adaptation Strategy by the California Natural Resources Agency. Safeguarding California serves as an outline of the action taken by the State government to respond to climate change. Safeguarding California additionally includes California’s next steps and how those steps will be reached. The Safeguarding California Plan is a tool by which the State divulges their progress to the public to ensure accountability. Safeguarding California was first prepared in 2009, known at the time as the California Adaptation Strategy, and was most recently updated in 2018.

### *Fourth Climate Change Assessment*

California's Climate Change Assessments provide the scientific foundation for understanding climate change-related impacts and associated vulnerabilities throughout California at the state and regional level. The most recent assessment, the Fourth Assessment, was released in 2018. The Fourth Assessment includes existing and projected future climate conditions, a description of physical impacts of climate change, and the science on the ecological systems and the impacts climate change has on them. This scientific background is used as a foundation to inform actions to increase resiliency by directly informing State policies, plans, programs, and guidance to ultimately safeguard the state from climate change. Findings in the Fourth Climate Change Assessment are also provided as summary reports and brochures that allow the public and decision-makers to easily access the information and recommendations for vulnerable sectors.

The California Fourth Climate Change Assessment published the San Francisco Bay Area Region Report, which details region-specific impacts from climate change. Projected changes to the San Francisco Bay Area region, and Santa Rosa, include:

- Increase in the minimum and maximum temperatures.
- Increase in the frequency of both extreme-dry and locally extreme rainfall events.
- Increase in the frequency of droughts as a result in prolonged periods of dry weather.
- Wildfire threat increase due to prolonged dry spells.

## **Regional**

### *North Coast Regional Water Quality Control Board*

The Porter-Cologne Water Quality Control Act (California Water Code Sections 13000 et seq.) established the SWRCB and divided California into nine regional basins, each under the jurisdiction of a Regional Water Quality Control Board (RWQCB). The North Coast RWQCB – Region 1 regulates water quality in Santa Rosa. The North Coast RWQCB has the authority to require groundwater investigations and/or remedial action if the quality of groundwater or surface waters of the state are threatened.

### *Bay Area Air Quality Management District*

The Bay Area Air Quality Management District (BAAQMD) has primary responsibility for control of air pollution from sources other than motor vehicles and consumer products. The latter are typically the responsibility of the CalEPA and CARB. The BAAQMD is responsible for preparation of attainment plans for non-attainment criteria pollutants, control of stationary air pollutant sources, and issuance of permits for activities, including demolition and renovation activities affecting asbestos-containing materials (District Regulation 11, Rule 2) and lead (District Regulation 11, Rule 1). The BAAQMD's boundaries embrace the south part of Sonoma County, including Santa Rosa.

### ***Bay Area Urban Areas Security Initiative***

The Bay Area Urban Areas Security Initiative (UASI) is a program intended to provide financial assistance to address multi-discipline planning, organization, equipment, and training needed to address high-threat terrorist attacks and natural disasters in the urban centers of the nine Bay Area counties. The UASI awards grants to urban areas to assist in building and sustaining capacity to prevent, protect against, mitigate, respond to, and recover from disasters through regional approaches. Aid primarily involves extensive training and exercises, but also includes cybersecurity aid, information sharing, public information and warning tactics, and risk management and infrastructure protection, among other services (Bay Area Urban Areas Security Initiative 2019).

### ***Sonoma County Department of Health Services, Environmental Health and Safety Branch***

A Certified Unified Program Agency (CUPA) is a local agency that has been certified by CalEPA to implement the local unified program. The CUPA can be a county, city, or joint powers authority. A participating agency is a local agency that has been designated by the local CUPA to administer one or more unified programs within their jurisdiction on behalf of the CUPA. The Sonoma County Department of Health Services, Environmental Health and Safety Branch, is the certified CUPA for the City of Santa Rosa and vicinity.

### ***Sonoma County Water Agency***

The Sonoma County Water Agency (Sonoma Water) is the flood-control and water supply agency for Sonoma County. Their responsibilities include creek restoration, pollution prevention efforts, and groundwater recharge, as well as water supply services and wastewater treatment and disposal. Sonoma Water has partnered with federal agencies to help build and manage a variety of flood protection projects in Sonoma County.

### ***Sonoma County Emergency Operations Plan***

The 2014 *Sonoma County Operational Area Emergency Operations Plan* (Sonoma County EOP) is the primary planning document of the Sonoma County Department of Emergency Management. The Sonoma County EOP addresses the planned response to extraordinary emergency situations, such as large-scale disasters. The Sonoma County EOP provides a flexible platform for planning and response to all hazards and emergencies, such as earthquakes, WUI fires, floods, and landslides, among others. The primary purpose of the Sonoma County EOP is to facilitate multiagency and multi-jurisdictional coordination during emergency operations between the County and its local jurisdictions, as well as between State and federal agencies.

## **Local**

### ***City of Santa Rosa General Plan 2035 Policies***

The City of Santa Rosa *2035 General Plan* is the regulating land use document for the City. The *2035 General Plan* includes goals and policies written to achieve the vision of the community. Several goals and policies included in the *2035 General Plan* are focused on increasing public health and safety by working to reduce the impact that natural hazards have on the community, and ensuring the City has the ability to respond in the event of an emergency, particularly in

response to seismic, geologic, flooding, dam inundation, wildfire, hazardous materials, and airport hazards. Goals and policies pertaining to natural hazards and resiliency are found in the Noise and Safety (NS), Public Services and Facilities (PSF), and the Transportation (T) Elements of the *2035 General Plan*, and include:

- **Goal NS-A:** Prepare for disasters
  - **Policy NS-A-1:** Maintain the Emergency Operations Plan as the city’s disaster-response plan. Work with Sonoma County to update joint-emergency response and disaster response plans, as needed.
  - **Policy NS-A-2:** Continue to promote the Citizens Organized to Prepare for Emergencies (COPE) public awareness program on the nature and extent of natural hazards in the Planning Area, and ways of minimizing the effects of disasters.
  - **Policy NS-A-3:** Establish community programs which train volunteers to assist police, fire, and civil defense personnel during and after disasters.
  - **Policy NS-A-4:** Implement the Local Hazard Mitigation Plan to better prepare Santa Rosa for disaster.
  - **Policy NS-A-5:** Locate essential public facilities, such as hospitals and clinics, emergency shelters, emergency command centers, and emergency communications facilities, outside of high fire risk area, flood hazard zones, and areas subject to dam inundation.
- **Goal NS-C:** Prohibit development in high-risk geologic and seismic hazard areas to avoid exposure to seismic and geologic hazards.
  - **Policy NS-C-1:** Prior to development approval, require appropriate geologic studies to identify fault trace locations within active fault zones as designated by the provisions of the Alquist-Priolo Earthquake Fault Zoning Act. California registered geologists or engineers must conduct these studies and investigation methodologies must comply with guidelines set forth by the Alquist-Priolo Earthquake Fault Zoning Act.
  - **Policy NS-C-2:** Require comprehensive geotechnical investigations prior to development approval, where applicable. Investigations shall include evaluation of landslide risk, liquefaction potential, settlement, seismically induced land sliding, or weak and expansive soils. Evaluation and mitigation of seismic hazards, including ground shaking, liquefaction, and seismically induced landslides, shall comply with guidelines set forth in the most recent version of the California Division of Mines and Geology (CDMG) Special Publication 117.
  - **Policy NS-C-3:** Restrict development from areas where people might be adversely affected by known natural or manmade geologic hazards. Hazards might include unstable slopes, liquefiable soils, expansive soils or weak poorly engineered fills, as determined by a California registered geologist or engineer.
  - **Policy NS-C-4:** Restrict development of critical facilities--such as hospitals, fire stations, emergency management headquarters, and utility lifelines, including broadcast services, sewage treatment plants, and other places of large congregations—in areas determined as high-risk geologic hazard zones (e.g. Rodgers Creek Fault zone, liquefiable soils, areas of slope instability).

- **Policy NS-C-5:** Require identification and evaluation of existing structural hazards related to unreinforced masonry, poor or outdated construction techniques, and lack of seismic retrofit. Abate or remove any structural hazard that creates an unacceptable level of risk, including requiring post-earthquake buildings that are not currently retrofitted and are located within areas determined to experience strong ground shaking during an earthquake.
- **Policy NS-C-6:** Require appropriate and feasible seismic retrofit, as determined by a registered structural engineer, of commercial, industrial, and public buildings that are not currently retrofitted and are located within areas determined to experience strong ground shaking during an earthquake.
- **Policy NS-C-7:** Require inspection for structural integrity of water storage facilities, water conveyance facilities, electricity transmission lines, roadways, water detention facilities, levees, and other utilities after a major seismic event, especially on the San Andreas or Rodgers Creek faults.
- **Policy NS-C-8:** Adopt mandatory, minimum erosion control measures for current properties and those under construction that exhibit high erosion potential, are in areas of steep slopes, or have experienced past erosion problems. Control measures shall reduce soil erosion from primary erosional agents, including wind, construction operations, and storm water runoff.
- **Goal NS-D:** Minimize hazards associated with storm flooding
  - **Policy NS-D-1:** Ensure flood plain protection by retaining existing open areas and creating new open areas needed to retain stormwater, recharge aquifers, and prevent flooding.
  - **Policy NS-D-2:** Maintain current flood hazard data, and coordinate with the Army Corps of Engineers, FEMA, Sonoma County Water Agency, and other responsible agencies to coordinate flood hazard analysis and management activities.
  - **Policy NS-D-3:** Require that new development and redevelopment projects meet the requirements of the Storm Water Low Impact Development Technical Design Manual to reduce impermeable surface area, increase surface water infiltration, and minimize surface water runoff during storm events. Such features may include:
    - Additional landscape areas;
    - Vegetated swales with bioretention;
    - Rain gardens; and
    - Pervious pavement.
  - **Policy NS-D-4:** Incorporate features and appropriate standards that reduce flooding hazards.
  - **Policy NS-D-5:** Apply design standards and guidelines to new development that help reduce project runoff into local creeks, tributaries, and drainage ways.
  - **Policy NS-D-6:** Evaluate flood hazards prior to approval of development projects within a Federal Emergency Management Agency (FEMA) designated flood zone. Ensure that new development within flood zones is designed to be protected from flooding without negatively affecting adjacent areas.

- **Goal NS-E:** Provide protection of public and private properties from hazards associated with dam inundation.
  - **Policy NS-E-1:** Support efforts to conduct periodic inspections of local dams to ensure all safety measures are in place.
- **Goal NS-F:** Minimize dangers from hazardous materials.
  - **Policy NS-F-1:** Require remediation and cleanup, and evaluate risk prior to reuse, in identified areas where hazardous materials and petroleum products have impacted soil or groundwater.
  - **Policy NS-F-2:** Require that hazardous materials used in business and industry are transported, handled, and stored in accordance with applicable federal, state, and local regulations.
  - **Policy NS-F-3:** Restrict siting of businesses, including hazardous waste repositories, incinerators or other hazardous waste disposal facilities, that use, store, process, or dispose large quantities of hazardous materials or wastes in areas subject to seismic fault rupture or very violent ground shaking.
  - **Policy NS-F-4:** Where applicable, identify and regulate appropriate regional and local routes for transportation of hazardous materials and hazardous waste. Require that fire and emergency personnel can easily access these routes for response to spill incidences.
  - **Policy NS-F-5:** Require commercial and industrial compliance with the Sonoma County Hazardous Materials and Waste Management Plan.
  - **Policy NS-F-6:** Generate and support public awareness and participation in household waste management, control, and recycling through county programs including the Sonoma County Household Hazardous Waste Management Plan.
- **Goal NS-G:** Minimize the potential for wildland fires.
  - **Policy NS-G-1:** Require proposed developments in the Wildland-Urban Interface zone, including the Very High Fire Hazard Severity zone, to investigate a site's vulnerability to fire and to minimize risk accordingly.
  - **Policy NS-G-2:** Require new development in Wildland-Urban Interface areas to utilize fire resistant building materials. Require the use of on-site fire suppression systems, including enhanced automatic sprinklers systems, smoke and/or detection systems, buffers and fuel breaks, and fire resistant landscaping. Require development and ongoing implementation of vegetation management plans to reduce the risk of wildland fires and to help prevent fires from spreading.
  - **Policy NS-G-3:** Prohibit untreated wood shake roofs in Wildland-Urban Interface areas.
  - **Policy NS-G-4:** Continue monitoring water fire-flow capabilities throughout the city and improving water availability at any locations having flows considered inadequate for fire protection.
  - **Policy NS-G-5:** Require detailed fire prevention and control measures, including community fuel breaks, for development projects in the Wildland-Urban Interface, including very high fire hazard severity zones.

- **Policy NS-G-6:** Minimize single-access residential neighborhoods in development areas near open space, and provide adequate access for fire and other emergency response personnel.
- **Goal PSF-H:** Meet the city's solid waste disposal needs, while maximizing opportunities for waste reduction and recycling.
  - **Policy PSF-H-5:** Continue public education programs about waste reduction, including recycling, yard waste, wood waste, and household hazardous waste.
- **Goal T-M:** Continue the availability of air transportation services.
  - **Policy T-M-2:** Work with Sonoma County to maintain Charles M. Schulz-Sonoma County Airport's continued safe and successful operation by discouraging the development of incompatible uses in airport safety zones.
  - **Policy T-M-3:** Support efforts at the Charles M. Schulz-Sonoma County Airport to minimize negative effects of air transportation, such as surface street congestion, air pollution, noise, and safety concerns.

### *Santa Rosa City Code*

SRCC consists of all the regulatory, penal, and administrative laws of the City of Santa Rosa. SRCC covers various topics to reinforce City laws, which include provisions concerned with minimizing the impacts of natural hazards, specifically hazards pertaining to seismic, geologic, flooding, and wildfire. Additional SRCC provisions reduce the occurrence of, and impact from, hazardous materials. These provisions include the following.

**Chapter 18-16, California Building Code (CBC):** The City of Santa Rosa adopted CBC as its Building Code in SRCC. CBC identifies building design standards, including those for fire and seismic safety. Typical fire safety requirements of CBC include the installation of fire sprinklers in all new high rise buildings; the establishment of fire resistance standards for fire doors, building materials, and particular types of construction; and clearance of debris and vegetation within a prescribed distance from occupied structures in wildfire hazard areas. SRCC additionally adopted more stringent requirements for automated fire sprinklers than in CBC. SRCC additionally adopted seismic hazard related regulations, with amendments which include, but are not limited to, design requirements for retaining walls, creation of a permit appeals board, and building address identification requirements. SRCC also includes requirements for the performance and review of geological investigations prior to the issuance of building permits in a State-designated Alquist-Priolo fault zone.

**Chapter 18-22, California Residential Code (CRC):** The City of Santa Rosa adopted CRC as its Residential Building Code in the SRCC. CRC identifies residential building standards which include standards for fire safety. Typical fire safety requirements in residential developments include fire sprinklers, vegetation management, roof coverings within high fire hazard zones, and use of fire-retardant materials. SRCC additionally adopted more stringent requirements for automated fire sprinklers than in the CRC.

**Chapter 18-44, 2019 California Fire Code (CFC):** The City of Santa Rosa adopted CFC as its Fire Code in the SRCC. CFC includes provisions and standards for emergency planning and preparedness, fire service features, fire protection systems, hazardous materials, fire flow requirements, and fire hydrant locations and distribution. Typical fire safety requirements include: installation of sprinklers in all high-rise buildings; the establishment of fire resistance standards for fire doors, building materials, and particular types of construction; and the clearance of debris and vegetation within a prescribed distance from occupied structures in wildfire hazard areas. SRCC additionally adopted more stringent requirements for automated fire sprinklers than in CFC.

**Chapter 18-48, Review and Abatement of Existing Buildings:** This chapter was originally enacted in 1971 as Resolution 9820. The chapter provides procedures for the systematic evaluation and reconstruction of existing buildings within the City to make reconstruction economically feasible and to improve the safety of life in seismically hazardous buildings.

**Chapter 18-52, Flood Damage Protection:** This chapter is in accordance with FEMA regulations and establishes flood damage prevention measures that apply to all areas of special flood hazard (i.e., 100-year floodplains) within the city. Chapter 18-52 requires that buildings and development projects that are vulnerable to floods be protected against flood damage at the time of construction by obtaining a development permit and implementing construction standards as specified in the chapter.

**Chapter 17-34, Certified Unified Program Agency:** This chapter regulates emergency response and hazardous materials, including such topics as:

- Hazardous materials release response plans and inventory (business plan)
- Contents of hazardous materials business plans
- Acutely hazardous materials registration
- Risk management and prevention plans
- Underground storage tanks
- Hazardous waste generators and on-site treatment
- Closure work plans and closure reports
- Response to threatened or actual releases
- Enforcement authority
- Civil and criminal penalties

**Chapter 2-24, Emergency Organizations and Functions:** This chapter requires preparation and carrying out of plans for the protection of persons and property within the city of Santa Rosa in the event of an emergency, including the responsibilities of the emergency organization, the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private persons. Chapter 2-24 additionally mandates an Office of

Director of Emergency Services, staffed by the City Manager, and an Office of the Assistant Director of Emergency Services, which is appointed by the City Manager. The Director of Emergency Services directs the City Council in times of emergency crises, requests a “state of emergency” from the Governor of California, and controls and directs emergency organization, as outlined in Chapter 2-24.

### *City of Santa Rosa 2016 Local Hazard Mitigation Plan*

The Santa Rosa LHMP identifies and evaluates the City’s vulnerabilities to various disasters. The purpose of the LHMP is to provide a blueprint for reducing the City’s vulnerabilities to disasters by identifying the capabilities, resources, information, strategies for risk reduction, and critical facilities, and providing guidance for and coordination of mitigation actions. The LHMP reflects the best available science, ensures policies are consistent with current City standards and/or other relevant federal, State, or regional regulations, and that the City has an updated plan consistent with FEMA requirements. Implementation of the LHMP is achieved through strategies and mitigation actions, largely outlined in Table 34, Hazard Mitigation Actions, of the LHMP. Actions that are relevant to seismic, geologic, flood, dam inundation, drought, wildfire, and hazardous materials in addition to emergency response preparedness include:

**Mitigation Action 1.3.** Continue to analyze and improve emergency response communications.

This strategy should include building redundant capacity into public safety alerting and answering points as well as replacing or hardening microwave and simulcast systems.

**Mitigation Action 1.4.** Continue to assess the vulnerability of critical facilities to damage from natural disasters, including the availability of backup power and sufficient supplies to maintain essential functions, and make recommendations for appropriate mitigation.

**Mitigation Action 1.6.** Continue to participate not only in general mutual aid agreements but also in agreements with adjoining jurisdictions and special districts for cooperative response to fires, floods, earthquakes, and other disasters.

**Mitigation Action 1.11.** Continue to coordinate with Sonoma County and surrounding jurisdictions on emergency notifications, including alerts of imminent threats or a need to evacuate. Alerts should be made available through multiple methods, in commonly spoken languages in Santa Rosa, and easily accessible to persons with access and functional needs.

**Mitigation Action 1.13.** Continue to work with regional utility companies and service agencies, including energy providers, telecommunication services, and transit operators, to maintain basic services as much as possible during emergency conditions and to restore services as quickly as possible following an emergency event.

**Mitigation Action 1.14.** Work to improve estimates of potential casualties and property damage as a result of different emergency situations.

**Mitigation Action 1.15.** Continue to update the City’s emergency planning documents every five years to ensure consistency with state and federal law, local conditions, and best practices and the most recent science.

- Mitigation Action 1.16.** Continue to improve the reliability of water supply for emergency response purposes through new water main connections and system improvements.
- Mitigation Action 2.1.** Update the City's Wildland-Urban Interface (WUI) overlay designation to reflect up-to-date information on wildfire hazards and WUI exposure to prepare for future fire risk.
- Mitigation Action 2.2.** Identify and implement vegetation management programs in the City's WUI zone.
- Mitigation Action 2.3.** Work with residents and property owners to develop an incentive program to replace shake roofs in the WUI.
- Mitigation Action 2.4.** Continue to implement improvements to water flow capacity in the WUI.
- Mitigation Action 2.5.** Ensure adequate road or fire road access for fire equipment to developed and open space areas.
- Mitigation Action 2.6.** Continue to tie public education on defensible space and a comprehensive defensible space ordinance to a field program of enforcement.
- Mitigation Action 3.1.** Sustain the City's participation in FEMA's National Flood Insurance Program (NFIP).
- Mitigation Action 3.2.** When FEMA creates, updates, and publishes flood zone mapping of the 100-year and 500-year floodplains, integrate information from the maps into the City's geographical information system and use flood information in the development review and public project review process. In areas with high flood risk, continue to evaluate and implement flood hazard mitigation projects to reduce potential for property damage, street flooding, and stream erosion.
- Mitigation Action 3.3.** Continue to analyze pump station condition and capacity, and upgrade as appropriate.
- Mitigation Action 3.4.** Evaluate, monitor, and maintain the City's stormwater drainage system to ensure it can effectively handle anticipated stormwater volumes to the maximum extent possible, and make upgrades and repairs as needed. Coordinate with the Sonoma County Water Agency to clear debris and remove vegetation and sediment in flood control channels within the City to protect flow capacity.
- Mitigation Action 3.5.** Continue to pursue grant funding to complete creek restoration projects that result in bank stabilization, enhanced habitat, and flood capacity.
- Mitigation Action 3.6.** Retrofit public areas, including plazas, sidewalks, and parking lots as feasible, to use permeable paving and other low-impact development features that promote infiltration and reduce stormwater runoff.

**Mitigation Action 3.7.** Evaluate, prioritize, and implement flood protection measures to protect wastewater treatment facilities from flooding during a predetermined recurrence interval.

**Mitigation Action 4.1.** Replace or retrofit water-retention structures that are determined to be structurally deficient, including levees, dams, reservoirs, and tanks. Continue to analyze and identify needs for future upgrades. Evaluate, reinforce, and/or enhance wastewater treatment facility structures with seismic risk.

**Mitigation Measure 4.2.** Consider developing funding mechanisms to assist building owners to afford retrofits to unreinforced masonry, soft-story, and/or non-ductile concrete structures.

**Mitigation Measure 4.3.** Require the retrofit of seismically vulnerable structures consistent with City Code. This program should include community education and outreach.

**Mitigation Measure 4.4.** Identify/analyze sanitary sewer trunk lines that are determined to be structurally deficient where crossing fault zones. Retrofit/replace as necessary.

**Mitigation Measure 4.5.** Conduct seismic evaluations on City-owned leased buildings that contain critical facilities/operations to determine the need for upgrades/retrofitting.

**Mitigation Measure 5.1.** Require comprehensive geotechnical investigations prior to development approval, where applicable. Investigations shall include evaluation of landslide risk, liquefaction potential, settlement, seismically induced landsliding, or weak and expansive soils, as identified by Noise and Safety Element Policy NS-C2.

**Mitigation Measure 5.2.** Restrict development from areas where people might be adversely affected by known natural or man-made geologic hazards, including unstable slopes, liquefiable or expansive soils, and poorly engineered fills, as determined by a California registered geologist or engineer, as identified by Noise and Safety Element Policy NS-C-3.

**Mitigation Measure 5.3.** Pursue implementation of regulatory requirements related to erosion and sediment control. As needed, adopt additional, mandatory, minimum sediment and erosion control measures for current properties and those under construction that exhibit high erosion potential, are in areas of steep slopes, or have experienced past erosion problems. Sediment and erosion control measures shall reduce soil erosion from primary erosional agents, including wind, construction operations, and stormwater runoff, as identified by Noise and Safety Element Policy NS-C-8.

**Mitigation Action 6.1.** Provide reliable water delivery and wastewater collection, treatment, and disposal services during and after disasters to reduce the risk to public health and the environment.

**Mitigation Action 6.2.** Generate and support public awareness and participation in household waste management, control, and recycling through County programs including the Sonoma County Household Hazardous Waste Management Plan, as identified by Noise and Safety Element Policy NS-F-6.

**Mitigation Action 6.3.** Continue to improve the capabilities of the Fire Department to respond to new hazardous materials incidents/emergencies.

**Mitigation Action 6.4.** Update the Hazardous Materials Area Response Plan.

**Mitigation Action 6.5.** Enhance protection of existing groundwater resources from hazardous material sites.

**Mitigation Action 6.6.** Continue to provide and improve outreach to businesses that store, handle, and use hazardous materials over the state threshold or generate hazardous waste.

**Mitigation Action 7.1.** Complete and implement recommendations of the Santa Rosa Emergency Groundwater Supply project, including construction of emergency groundwater wells consistent with the recommendations of the adopted Emergency Groundwater Master Plan.

**Mitigation Action 7.2.** Continue to participate in the Russian River Watershed Association to provide water conservation guidance, encourage drought-tolerant landscaping, and reduce the consumption of potable water.

**Mitigation Action 7.3.** Replace water meters in existing development to allow customers to track real-time water use and support water conservation efforts, consistent with Climate Action Plan Action 7.1.3.

**Mitigation Action 7.4.** Implement advanced metering infrastructure to facilitate water conservation, consistent with Climate Action Plan Action 7.1.4.

**Mitigation Action 7.5.** Develop a plan for expediting the repair and functional restoration of water and wastewater systems through stockpiling of shoring materials, temporary pumps, surface pipelines, portable hydrants, and other supplies, such as those available through the Water/Wastewater Agency Response Network (WARN). Communicate that plan to local governments and critical facility operators.

**Mitigation Action 7.6.** Host regular workshops and classes on water conservation strategies, including drought-tolerant landscaping and available rebates for water conservation and water efficiency actions. Continue workshops, classes, and other educational efforts even in the absence of drought conditions.

**Mitigation Action 8.1.** Support the State's efforts to conduct periodic inspections of local dams and implement recommended actions to ensure all safety measures are in place, as identified by Noise and Safety Element Policy NS-E-1.

**Mitigation Action 8.2.** Integrate updated dam inundation mapping from the State Office of Emergency Services into the City's geographic information system and utilize the information in the development review process.

### ***Santa Rosa Fire Department***

The Santa Rosa Fire Department (SRFD) is responsible for the registration, installation, operation, and abandonment of underground storage tanks (USTs) in Santa Rosa. In addition, SRFD maintains responsibility for enforcement of the CFC (with local amendments) and emergency abatement regulations in the SRCC.

### ***Continuity of Operations Plan***

The 2017 *City of Santa Rosa Continuity of Operations Plan* (COOP) ensures the adequate performance of essential government functions during and after a disaster or other such disruption. The COOP includes programs and objectives that carry out its critical mission of ensuring each City department or division can provide necessary services in time of crisis. The COOP designates a prioritization scale for services that are more essential than others, City leadership order of succession, delegations of authority, critical and essential resources, communications systems. The COOP additionally discloses and evaluates risks, vulnerabilities, and mitigation strategies, as well as testing and training programs.

### ***City of Santa Rosa Emergency Operations Plan***

The *City of Santa Rosa Emergency Operations Plan* (Santa Rosa EOP) is a focused version of the Sonoma County EOP, ensuring the unique needs of the City are adequately accounted for in the event of a disaster or equivalent emergency. Its primary intent is to govern operations following incidents that require the coordination of multiple City departments, external organizations, and jurisdictions, for mutual aid. The Santa Rosa EOP is based on the functions of the Standardized Emergency System.

### ***City of Santa Rosa Climate Action Plan***

The Santa Rosa Community-wide and Municipal Climate Action Plans guide GHG reduction policies and activities in the city. Each plan is based on a GHG inventory that calculates the annual emissions attributed to activities within the City of Santa Rosa and identifies measures to reduce those emissions in compliance with California law. The plans identify actions that have been undertaken to reduce GHG emissions, as well as actions to be taken over time to further reduce emissions. The plans also include a chapter on adaptation to climate change that recognizes that, even with significant efforts to mitigate GHG emissions, future climate change projections anticipate that climate change will still heavily impact the Santa Rosa area. The adaptation chapter summarizes current State and regional efforts to address climate change and directs the City to increase regional coordination and involvement in climate change adaptation efforts. The directives to the City are outlined in both measures and action items. Measures include topics such as regional coordination, preparedness, mainstreaming adaptation, and increased community engagement.

## 7.4 WILDFIRE HAZARDS

Areas vulnerable to intense and uncontrollable wildfires are present throughout Santa Rosa and Sonoma County. Wildfires can result in direct damage to the built environment and can injure or kill residents. Even if residents escape physically unscathed, economic constraints, emotional stress, and displacement all pose significant burdens on recovering communities. Fires can also cause damage to infrastructure or other systems that may affect Santa Rosa and the entire San Francisco Bay Area region. Secondary impacts from wildfires can include power outages from damaged power lines, poor air quality due to smoke and ash, and impacts to water quality from ash and debris entering watersheds.

Natural and cultural resources are also under threat of fire. Fire can destroy vegetation, including root structures that previously supported sloped soils, increasing the risk of mudslide and landslides. The Santa Rosa Plain includes a vast oak savannah grassland with vernal pools and swales that support endemic plants and animals. The Santa Rosa area has six species listed as endangered and two species listed as threatened by the federal Endangered Species Act (ESA). Many remnants of Native American civilization have been found in the area, and there is a high potential for finding additional Native American sites in Santa Rosa. There are also numerous historic, architectural, and cultural assets within the city at risk of fire.

CAL FIRE designates levels of wildfire severity based on the amount of vegetation, topography, and weather (i.e., temperature, humidity, and wind). Based on these factors, CAL FIRE develops maps that depict wildfire hazard areas representing the likelihood of an area burning over a 30- to 50-year period. CAL FIRE categorizes the hazard levels for two areas: SRAs with moderate to very high hazard, where CAL FIRE is responsible for fire protection; and LRAs with very high fire hazard, where local fire departments and fire protection districts have responsibility. **Figure 7-2** identifies the parts of the city of Santa Rosa and surrounding areas that are within SRA and LRA zones, as well as areas of past wildfires in and around Santa Rosa from 1950 through 2018.

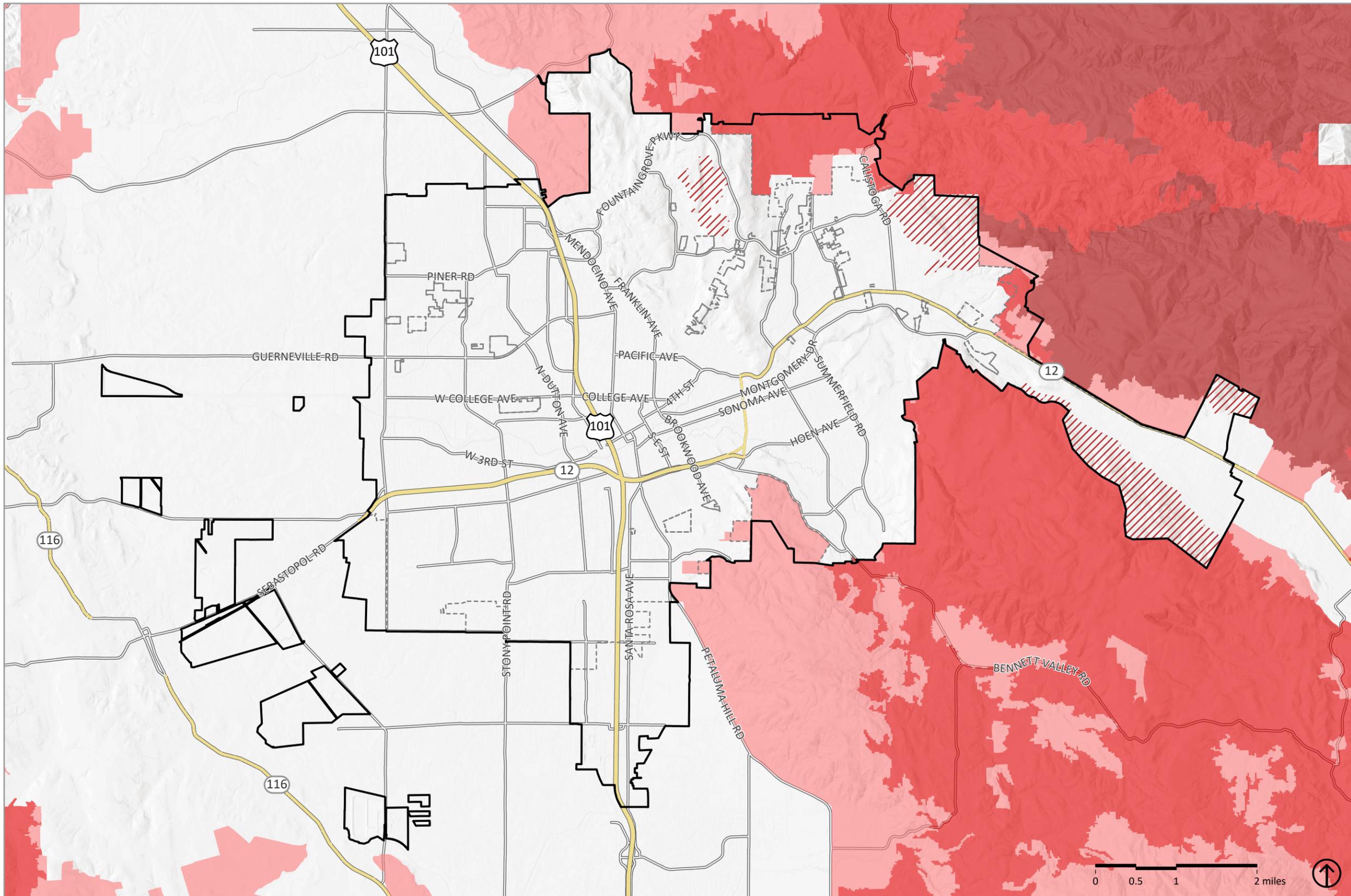


Figure 7-2  
 Fire Hazard  
 Severity Zones

- Fire Severity in LRA
- Very High
- Fire Severity in SRA
- Very High
- High
- Moderate
- Planning Area
- City Limit

Recognizing the vulnerability of WUI areas, CAL FIRE has also produced WUI maps that designate areas with burnable vegetation and residential density greater than one unit per 20 acres. CAL FIRE's WUI zones highlight areas of potential fire risks that also have high exposure of people and property. On February 24, 2009, the Santa Rosa City Council approved an amendment to Chapter 47, Section 18-44.4702.1, of the 2007 California Fire Code defining a WUI fire area as follows:

"Wildland-Urban Interface Fire Area is a geographical area in the City of Santa Rosa at significant risk from wildfires as designated on the map titled Wildland-Urban Interface Fire Area, dated January 28, 2009 and retained on file in the City Geographic Information System and in the Office of the City's Fire Marshall. The Wildland-Urban Interface Fire Area shall include Very High Fire Hazard Severity Zones recommended by the Director of the California Department of Forestry and Fire Protection pursuant to Public Resource Code sections 4201 – 4204 and Government Code sections 51175 – 51189."

The City created a local WUI zone to identify and consolidate four types of fire hazard zones in the community: Moderate, high, very high, and mutual threat. The local WUI zone is based on areas of significant risk identified by CAL FIRE as a VHFHSZ, in addition to other self-defined WUI areas that reflect local knowledge of landscape and site characteristics. Approximately 30 percent of the community is in the City's WUI zone as shown in **Figure 7-3**.

Hillside residential neighborhoods in the northern and eastern portions of the city are at high risk of wildland fire, and historically have been the site of such fires. Open areas and slopes covered with tall grasses and/or chaparral provide fuels to feed wildfires, once started.

Structural vulnerability to fire depends primarily on exterior construction material, structure design, housing density, placement relative to nearby homes, geographic location, and whether the structure has adequate defensible space. Older homes with wood shake shingle roofs are especially vulnerable to fire; as of yet, there is no data about the specific number of homes with this roof type but some do exist in the WUI zone.

There is potential for structure loss even outside of areas designated as VHFHSZs or WUI. Burning embers can be carried by wind for over a mile, so structures within that distance of an active fire that are poorly maintained, landscaped with flammable ornamental vegetation, and/or have rain gutters built up with flammable debris are particularly vulnerable.

SRFD has primary responsibility for fire protection within City limits. The City is aided by CAL FIRE and surrounding local fire departments, such as Rincon Valley Fire Protection District, Bennett Valley Fire Department, Kenwood Fire Department, Rohnert Park Department of Public Safety, Windsor Fire Department, and Sebastopol Fire Department. The City owns 16 Type-1 fire engines and can also draw on agreements with the Sonoma County Fire Protection Authority or CAL FIRE to provide the closest firefighting resources for a fire. Santa Rosa also has a 2006 agreement with CAL FIRE that provides for CAL FIRE response on LRA lands as needed, which allows the City to leverage the State's considerable firefighting resources, including aircraft. Based on fire danger, various dispatch levels have been established in the agreement that define the number and kind of resources that CAL FIRE will send to a reported wildfire.

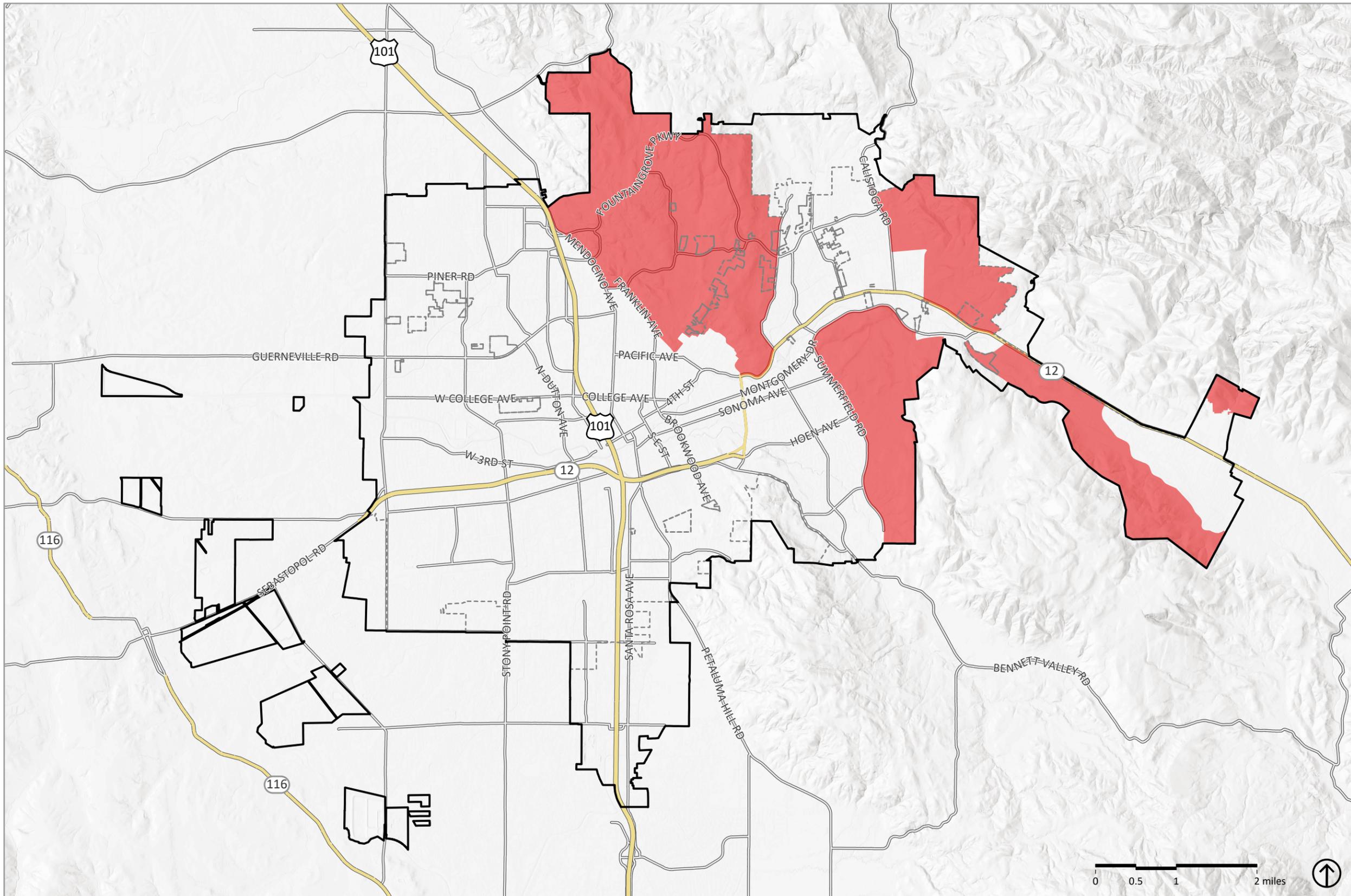


Figure 7-3  
**Wildland-Urban  
 Interface**

- WUI Zones
- Planning Area
- City Limit

SRFD also has a Fire Prevention Bureau staffed by a Fire Marshal, two Assistant Fire Marshals, three Fire Inspectors, a Plan Checker, and administrative personnel. Additionally, all nine of the City's fire stations are involved in a fire inspection program and work closely with Fire Inspectors to reduce community fire risk. To help reduce seasonal fire risk, the City has a Weed Abatement Ordinance (Ordinance No. 3681) that requires property owners to cut weeds and grasses over four inches tall once fire season is declared and maintain that level of compliance throughout the season. The ordinance applies to owners of all undeveloped properties, all developed properties with over 0.5 acres of unimproved land, and all properties located in the WUI zone. Fire Department staff conduct weed abatement inspections during fire season and non-complying property owners are subject to a citation and fine.

General Plan policies aim to minimize the potential for wildland fires and prepare for climate changes. Fire-resistant building materials and landscaping are required for new development in WUI areas. Ensuring adequate fire flow capabilities of the City's water system and requiring community fire breaks in residential subdivisions work to mitigate the potential for fire damage.

Following the completion of the Santa Rosa General Plan 2035 in 2009, the City adopted the 2010 LHMP Annex to the ABAG Plan in 2012. The 2010 LHMP Annex identified wildfire as a potential hazard for the community.

State law (SB 1241) passed in 2012 requires local General Plans to address SRAs and Very High Severity Zones in LRAs. It specifically requires that upon the next revision of the housing element on or after January 1, 2014, General Plan Safety Elements shall be reviewed and updated as necessary to address the risk of fire for land classified as SRAs, and land classified as VHFHSZs in LRAs, and to consider the advice included in the California Governor's Office of Planning and Research (OPR) 2015 publication, Fire Hazard Planning, General Technical Advice Series. Detailed specifications for the review included a comprehensive fire hazard assessment for the community; a set of goals, policies, and objectives for community wildfire protection; a set of feasible implementation measures designed to carry out the goals, policies, and objectives including, but not limited to:

- Avoiding or minimizing the wildfire hazards associated with new uses of land.
- Locating, when feasible, new essential public facilities outside of high fire risk areas, or identifying construction practices or other methods to minimize damage if these facilities are located in an SRA or VHFHSZ.
- Designing adequate infrastructure if a new development is in an SRA or VHFHSZ, including safe access for emergency response vehicles, visible street signs, and water supplies for structural fire suppression.
- Working cooperatively with public agencies with responsibility for fire protection.

SB 1241 also requires three specified findings before cities and counties can approve a Tentative Subdivision Map (regarding design and location of each lot to State Board of Forestry regulations, regarding fire protection and suppression, and regarding ingress and egress).

The 2016 LHMP elevated the priority of wildfire hazards and provides a very detailed risk assessment that also considers vulnerable populations and community assets at risk to wildfire hazards. It also identified six major mitigation actions for the City to undertake along with timing and responsible parties:

- Update the City’s WUI overlay designation to reflect up-to-date information on wildfire hazards and WUI exposure to prepare for future fire risk.
- Identify and implement vegetation management programs in the City’s WUI zone.
- Work with residents and property owners to develop an incentive program to replace shake roofs in the WUI.
- Continue to implement improvements to water-flow capacity in the WUI.
- Ensure adequate road or fire road access for fire equipment to developed and open space areas.
- Continue to tie public education on defensible space and a comprehensive defensible space ordinance to a field program of enforcement.

## October 2017 Fires

On Friday, October 6, 2017, the National Weather Service issued a Red Flag Warning for Sonoma County from Sunday, October 8, through Tuesday morning, October 10. On the night of Sunday, October 8, 2017, Santa Rosa and surrounding areas were experiencing above-normal wind speeds and reports of fires across the County. SRFD responded to 20 vegetation fires and six structure fires between 6:00 p.m. and midnight. The Tubbs Fire ignited near Highway 128 and Bennett Lane in Calistoga at 9:45 p.m. and the Nuns Fire ignited in the Sonoma County area north of Glen Ellen around the same time as the Fire Department was responding to multiple fires in the City and adjacent areas.

Strong winds pushed the Tubbs Fire toward Santa Rosa, spreading at an average speed of approximately 4.5 miles per hour, or 1 mile every 13.3 minutes. By 1:10 a.m., the fire reached the Fountaingrove neighborhood and by 2:01 a.m. it had jumped Highway 101, impacting a regional commercial center and surrounding neighborhoods, including Coffey Park. Nine Santa Rosa residents lost their lives, and 100,000 County residents evacuated from their homes. Three emergency shelters operated in the City. The Tubbs and Nuns fires were finally declared contained on October 30 and 31. The City spent approximately \$9 million in reserves for initial fire response costs and total suppression costs for the Tubbs Fire are estimated at \$100 million.

In all, the Tubbs Fire destroyed 3,043 residential units in the city of Santa Rosa—constituting 3 percent of the residential building stock—as well as 36 commercial buildings, including two hotels, a winery, a department store, and restaurants. It affected virtually the same areas of Santa Rosa as the 1964 Hanley Fire, but in addition it spread west of Highway 101 and burned 1,432 homes in Coffey Park; see **Figure 7-2** for a map of historical fire burn areas.

Direct losses totaled \$13 billion, of which, \$11 billion was insured. Business disruptions affected both small and large employers as well as their employees. Economic losses in the City of Santa Rosa were estimated at \$1.2 billion. In Fountain Grove, where 13 houses remained occupied after the fire, the water system was contaminated by benzene from the fire. Ultimately, it took one year to replace water service to 352 properties and 1,265 feet of water main at a cost of \$8 million.

### *Key City Responses and Lessons from the 2017 Fires*

As with all major disasters, recovery from the Tubbs Fire will take many years. The City acted quickly to pave the way for that process. Notable actions that the City took in response to the housing, infrastructure, fiscal and economic recovery challenges it has faced are:

- Santa Rosa City Council adopted an urgency ordinance, which expedited review process for hillside development and design review, waived fees for discretionary planning, demolition, and temporary housing permits and allowed residents to live in temporary housing units, such as RVs, manufactured homes, and tiny homes on their properties while rebuilding.
- City Council approved funding for a separate permit center exclusively for fire survivors rebuilding to expedite the rebuilding permit process and not cause further delays for routine permit business. The Resilient City Permit Center officially opened in November 2017 and as of August 2020, nearly 2,400 building permits had been issued.
- City Council adopted 2017/2018 goals that included “rebuild/build downtown and fire areas” and “downtown housing” in the Near Term and Tier 1 priorities.
- In spring of 2018, City Council adopted [Resilient City Development Measures](#) to expedite *new* housing development by streamlining the City’s permitting process in areas where it has prioritized housing, including Roseland and areas near transit, including the downtown.
- The City applied for and received a Priority Development Area (PDA) Planning Grant from the Metropolitan Transportation Commission (MTC) for a [Downtown Station Area Specific Plan amendment process](#) that is now analyzing existing development policies and regulations in the downtown area through a comprehensive community engagement process and focus on adding density and housing to a 650-acre area at the center of the city that includes Courthouse Square, Railroad Square, and surrounding residential neighborhoods.
- In November 2018, City of Santa Rosa voters approved a 0.25-cent sales tax to support the rebuilding of City infrastructure.

The City also took immediate action to evaluate its wildfire preparedness, mitigation, and response by participating in State and county-led inquiries and assessments and launching an independent after-action review of the City's capabilities in preparing for, responding to, and recovering from the October 2017 fires. The review called out City strengths in staff and community willingness to help in the face of danger and unrelenting positive attitude, as well as strong leadership. The report identifies 23 findings and 54 related recommendations for the City to undertake to become more prepared for and resilient during a disaster. They center around the following five areas of improvement:

- Situational assessment and information sharing
- Organization, staffing, and training
- Water system
- Transition to recovery and long-term recovery
- Fire safety

The City has been actively addressing each of the recommendations assigning responsible departments and points of contact, setting target dates of completion, and tracking the status of their actions. While the City has been able to undertake many of the recommendations on its own, some require approaches to address challenges, including communication infrastructure and vegetation management. Santa Rosa is actively collaborating with Sonoma County and other agency partners in the region to design and implement regional approaches.

In 2019, SRFD also conducted an outside assessment of organizational staffing needs, evaluating current conditions; projecting future growth, development, and service demand; and providing recommendations to enhance current services or provide an equal level of service over the next 5 to 10 years. The current Fire Department services utilization rate is 161 incidents per 1,000 population. This is higher than typical for similar-sized communities and reflects tourism demands on the Fire Department's workload and other factors.

The Fire Department staffing assessment anticipates a modest growth rate in Fire Department demand of about 2 percent per year; this, plus expected population growth, is likely to increase workload. The assessment makes 15 recommendations for improving the Fire Department's service delivery into the future with a focus on adding and restructuring staff. Some of the new staff positions recommended are a Vegetation Management Specialist to concentrate on the at-risk population living in homes within and bordering the WUI; an additional code-enforcement officer to distribute the increasing workload more evenly; and a Public Education Specialist to better educate the public about fire prevention.

The City was again threatened by wildfire on the evening of October 23, 2019, when the Kincade Fire started near the Geysers Geothermal plant in north Sonoma County. The Kincade Fire burned 77,758 acres and destroyed 374 buildings, prompting the largest evacuation in the history of Sonoma County. The fire burned to the outskirts of Windsor, north of the City, before the southerly progression of the fire stopped. Now, as this chapter is being written in August 2020, local, state, and federal firefighters are responding to a series of complex fires ignited by an unusual series of dry lightning storms that struck California, including fires to the west and north of Santa Rosa in Sonoma County.

## Future Wildfire Hazard Mitigation Planning

Although wildfires within and adjacent to the City have historically been infrequent, current climate models forecast a future that is dryer and warmer. Santa Rosa has warmed 2.1° F since 1895. Hotter and drier conditions in September and October are likely to increase under climate change, producing more favorable conditions for fire ignition and spread. Reduced nighttime humidity recovery across spring, summer, and fall seasons is a contributing factor to an observed trend towards increased fire danger in California more broadly, specifically because fuel aridity is greater, and fuels are less resistant to fire spread.

Even though future wildfires may be inevitable, the risk to humans can be minimized and the losses to homes, businesses, infrastructure, and other community resources can be significantly reduced through thoughtful planning and development. Studies of recent wildfire damage have also demonstrated the effectiveness of newer fire codes.

There are a large number of structures outside of the City's WUI zone that were either rebuilt after the 2017 Tubbs Fire, including those in Coffey Park, or built since 2008 that have not been required to follow the CBC Standards, Chapter 7A (WUI building construction standards) and thus are vulnerable to wildfires. There are also many structures within the WUI zone that were built prior to 2008, making them especially vulnerable to wildfires.

The City is in the process of completing a Community Wildfire Protection Plan (CWPP) that builds on the wildfire hazard analysis in the 2016 LHMP by providing more detailed risk assessment and developing an action plan to address the wildfire threat to the City. Broad stakeholder and community engagement have been part of the planning effort with several community workshops, a community survey with over 500 participants, and a robust schedule of agency/organization meetings. Once completed, the CWPP is intended to be added to the 2016 LHMP and is thus integral to the City's Safety Element. The CWPP describes a series of analyses that were performed to identify the City's greatest wildfire hazards and risks, defensibility, ember exposure, fire run damage potential, speed of onset, and safe separation distances, which then provide the framework for designing and prioritizing potential wildfire mitigation strategies for the entire study area that extends beyond the City limits.

The hazard analysis evaluates fire behavior using elevation, slope, aspect, surface fuel model, canopy cover, fuel moisture, and historic weather data to evaluate fire behavior. The outputs show concentrations of flame lengths over 8 feet within the Wild Oak neighborhood as well as in the northwest corner of the City along Skyfarm Drive. The Skyhawk neighborhood displays the greatest hazard along the eastern edge of the neighborhood. During a wildfire, these areas can pose considerable life safety threats to firefighters and residents and face significant structure loss and damage if existing vegetative conditions are not addressed.

Wildfire risk within and adjacent to the City is analyzed using historic weather data and existing fuel characteristics to calculate the probability of fire spreading from three fire simulation ignition points located on the east side of the City—Bennett Valley, Cross Creek, and Calistoga Road. Each was assigned 1,024 fire simulations burning under High and Very High Fire Danger conditions and allowed to burn unsuppressed for a seven-day modeling period.

The speed of fire onset analyses shows just how quickly wildfires can travel. Using the same three fire simulations, Scenario 1 burns from the ignition point along Mark West Springs Road to within the City limits within two to three hours. Scenario 2, which starts in the wildlands to the northwest of the intersection of Plum Ranch and Calistoga Roads, reaches the City limits within one to two hours after ignition. These estimates correlate with observations of fire spread during the 2017 fires and can be used to determine evacuation timing for future wildfires under similar conditions.

A safe separation distance analysis found that nearly one-third of parcels in the study area would be indefensible under extreme wildfire conditions, such as a Diablo wind event as occurred in 2017. Furthermore, a substantial proportion of these indefensible properties are within SFRD's jurisdiction. The safe separation distance values may be a helpful indicator of where additional WUI zones may be appropriately located, and where vegetation management activities could be prioritized.

A fuel mitigation strategy in the CWPP places the highest priority on maintaining existing vegetation treatments, and then looking to areas where new fuel treatments could enhance the wildfire protection of parts of the community. The strategy is organized by creating Treatment Units (Units) based on the City's WUI zones. Priorities for future proposed treatments are set at the Unit level, but no priorities are set at a City-wide level. The unit prioritization approach strategy was chosen as many locations within the City have currently existing fuels treatments or vegetation management programs that are privately funded. The CWPP recommends that these programs be encouraged to continue based on their internal direction rather than competing with locations that may require local or State funding support to establish a community-based program.

The City and local citizen groups currently collectively manage a substantial fuel treatment program, with approximately 838 acres. However, the existing program lacks coordination between the active management organizations as well as a landscape-level fuel treatment program that addresses the City's overall wildfire risk. Existing fuel treatments reflect the priorities of individual homeowner associations, open space management associations, the City, and other lesser active entities. A series of fuel treatment guidelines are proposed for evacuation routes and WUI zones that help the City and property owners to implement fuel treatments to address the wildfire hazard while minimizing impacts to natural resources.

The CWPP proposes the following action items:

- **Improve coordination and tracking of fire-reduction activities.** The CWPP notes that there is no responsible authority to track fuel treatment activities across the City. A consolidated geographic information system (GIS) database of ongoing activities has been developed as part of the planning effort. A series of tasks are recommended with the City taking responsibility for the database and ongoing tracking.
- **Improve evacuation routes with fuel treatments along roadways.** The CWPP identifies a series of tasks to address fuel reduction along priority roads, especially in the eastern side of the City.

- **Educate the public on wildfire mitigation and damage.** The CWPP identifies a series of tasks to improve the tools and methods of education and engagement with the public-at-large, property owners, and neighborhood groups on vegetation management, home hardening, evacuation, and safety.
- **Improve wildfire preparedness and coordination among governmental and non-governmental organizations.** The CWPP promotes collaboration with Sonoma County and other agencies on addressing the needs of vulnerable populations and on increasing City resident participation in the County’s Citizen Emergency Response Team (CERT) program and the LISTOS Spanish-speaking community program and planning for their effective wildfire-related roles.
- **Increase structural hardening of pre-2008 structures.** The CWPP identifies a series of tasks for the City to develop and adopt increased resiliency standards for structures as well as a voluntary home or community inspection program, and to secure funding sources for structural hardening, including potential tax breaks and/or cost sharing.
- **Vegetation treatment.** The CWPP recommends a series of tasks for the City and homeowner associations to strengthen and expand public-private vegetation management programs, establish permitting protocols for fire pile burning, securing public-private program funding sources, and establishing a monitoring program.
- **Improve enforcement of defensible space standards.** The CWPP calls for the adoption and enforcement of defensible space requirements with the WUI zones and on SRA lands surrounding the WUI zones, supported by increased funding and staffing for public education and an inspection program, as well as the development and incorporation of fire-safe landscape standards into the City Development Review Process within the WUI.
- **Increase staffing for wildfire mitigation.** The CWPP recommends creating a full-time Wildfire Specialist position with the Fire Department to focus on community engagement and CWPP implementation.
- **Consider expanding the designated WUI area.** The CWPP recommends use of the national Wildfire Coordinating Group’s definition of WUI to redefine the City’s WUI areas and assess potential insurance coverage implications prior to adoption. A [CWPP community outreach and planning session presentation](#) states that “because of the sensitivity to potential loss of insurance coverage and imposing stricter building standards on fire affected persons, the City is not expanding their existing WUI areas.”

The CWPP was approved by the City on August 25, 2020, and is pending approval by State agencies. To be approved at the state level, the plan must demonstrate that, at a minimum, it has had regional collaboration and develops a prioritized hazardous fuel treatment strategy as well as strategies to reduce structural ignitability as required by the 2003 Healthy Forests Restoration Act. The benefits of an approved plan include helping a community identify and clarify priorities for the protection of life, property, and critical resources and providing access to federal and state grant funds to accomplish wildfire hazard mitigation work. Funds distributed under the Healthy Forest Restoration Act (HFRA) and FEMA Hazard Mitigation grants focus on WUI areas. Community Wildfire Protection Plans can also influence where and how federal agencies implement fuel-reduction projects on federal land, as well as how additional federal funds may be distributed for projects on non-federal lands.

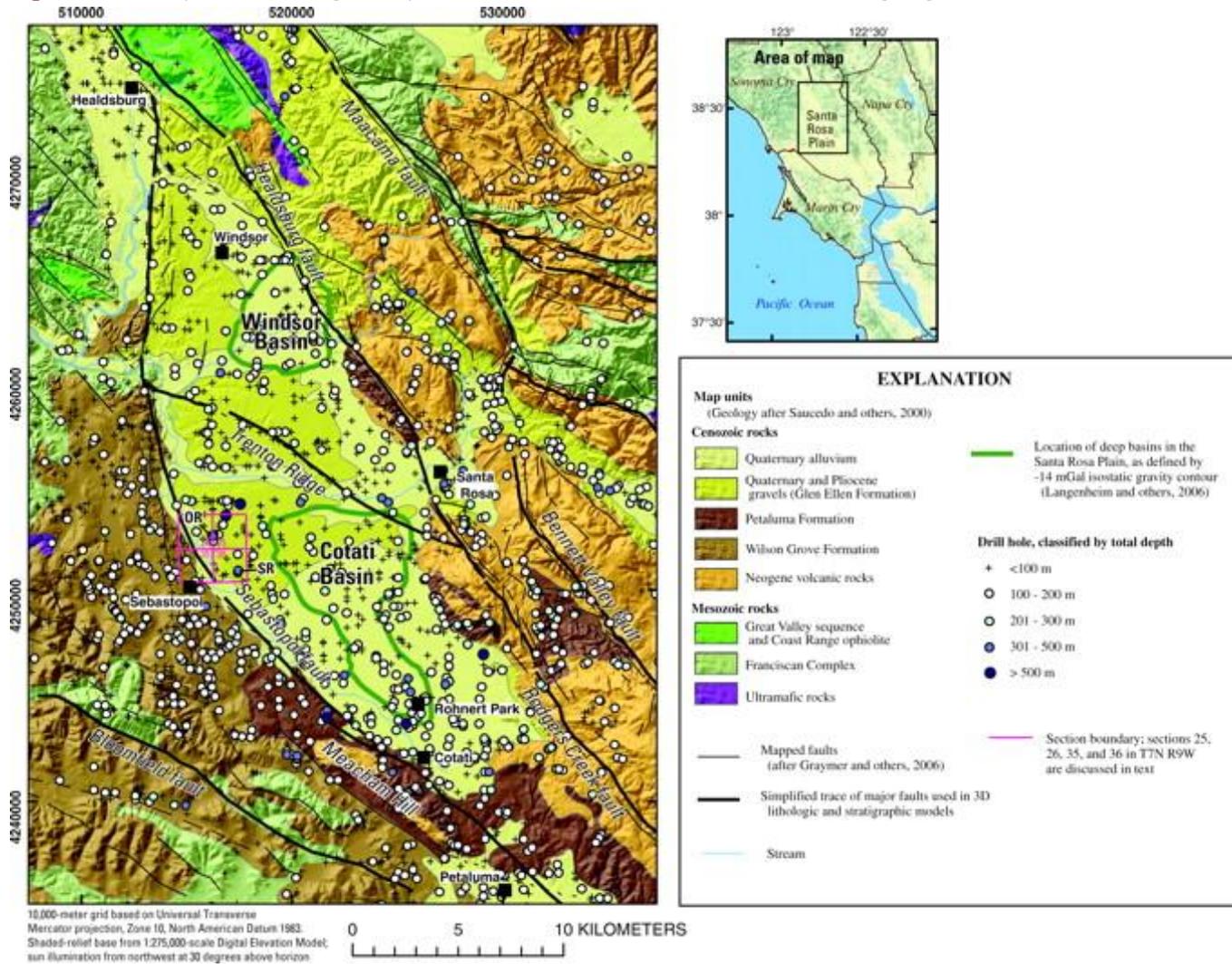
## 7.5 GEOLOGIC AND SEISMIC HAZARDS

Santa Rosa is located on the eastern side of the Santa Rosa Plain, a northwest-trending intermountain valley of the California Coast Ranges. The valley is bounded on the west by the Mendocino Ridge and on the east by the Sonoma and Mayacamas Mountains. As shown in **Figure 7-4**, the city's geology varies from consolidated sedimentary and volcanic rock in the highland areas to the east, to deep, uncompressed sediments of sand, silt, clay, and gravel underneath the relatively flat valley floor. Recent geophysical studies indicate that depositional basins underlying the Santa Rosa Plain in the vicinity of Santa Rosa may extend for more than a mile beneath the surface and may be the source of increased levels of ground shaking at the surface during earthquakes.

The Santa Rosa Plain is also bounded and transected by major faults, including the active northwest-striking, right-lateral Rodgers Creek-Healdsburg fault zone, running along the east side of the plain. The west and southwest side of the plain is bounded by a system of poorly defined faults generalized as the Sebastopol fault.

Santa Rosa General Plan policies prohibit development in high-risk geologic and seismic hazard areas to avoid exposure to these hazards. Comprehensive geologic and geotechnical investigations are required prior to development approval to ensure proper setback or appropriate design to minimize hazards. Development of critical facilities, such as hospitals, fire stations, emergency management headquarters, and utility lifelines, are restricted in high-risk geologic hazard zones. Other policies intend to abate structural hazards, require appropriate and feasible retrofits of seismically vulnerable buildings, and mandate erosion-control measures for properties within areas of steep slopes or with past erosion problems.

Figure 7-4. Simplified Geologic Map of the Santa Rosa Plain and Surrounding Highlands



The City's 2016 LHMP update analyzed the relevance of a comprehensive list of natural hazards to Santa Rosa. **Table 7-3** summarizes the determinations for each geologic and seismic hazard. Hazards that are not relevant to Santa Rosa are shown in light gray text.

Since the Santa Rosa General Plan 2035 was completed in 2009, new studies of geologic and seismic hazards in the vicinity of Santa Rosa have also been completed. Most notable are the studies of the geologic, hydrologic, and geochemical structures of the Santa Rosa Plain, more detailed mapping and estimates of creep along the Rodgers Creek Fault, and studies of the hazards and engineering implications of a magnitude 7 earthquake on the Hayward Fault system, which connects with the Rodgers Creek Fault. To account for this new information, geologic and seismic hazards of fault creep, fault afterslip, ground shaking, and fire following earthquake are also discussed in the following sections with an emphasis on new information since the 2009 General Plan update.

Table 7-3: Santa Rosa Geologic and Seismic Hazard Identification and Discussion			
Potential Hazards	Identified in the 2010 LHMP?	Included in 2016 LHMP Update	Discussion Summary
Avalanche	No	No	Not an applicable hazard in this part of California
Earthquake	Yes	Yes	Seismic activity is a known and historic threat to the city
Erosion	No	No	Impacts from erosion have been included in the analysis of flood hazards
Expansive Soils	No	No	There has been no significant damage from prior events
Fault Rupture	Yes	Yes	The Rodgers Creek Fault runs through the city and Santa Rosa is surrounded by other active faults
Landslide	Yes	Yes	Landslides have caused serious injury and property damage in the past
Liquefaction	Yes	Yes	The city's earthquake risk and soil composition also make Santa Rosa vulnerable to liquefaction
Subsidence	No	NO	There has been no significant damage from prior events
Source: City of Santa Rosa Local Hazard Mitigation Plan, October 2016			

## Earthquakes

Santa Rosa and communities across the San Francisco Bay region reside within the active boundary between the Pacific and North American tectonic plates, where the Pacific plate slowly and continually slides northwest past the North American plate. Several major and active faults are part of this complex plate boundary, most notably the San Andreas, Hayward, Rodgers Creek, Calaveras, Maacama, San Gregorio, Concord, Green Valley, and Greenville Faults, all of which are capable of producing ground shaking in Santa Rosa (see **Figure 7-5**).

In 2014, the Working Group on California Earthquake Probabilities updated the 30-year earthquake forecast for California and concluded that there is a 72 percent probability (or likelihood) of at least one earthquake of magnitude 6.7 or greater striking somewhere in the San Francisco Bay region before 2043. Earthquakes this large can cause widespread injuries, damage, and disruption. The San Andreas and Rodgers Creek-Hayward fault systems have the highest probabilities—22 and 33 percent, respectively—of generating a magnitude 6.7 or greater earthquake somewhere along these faults by the year 2043.

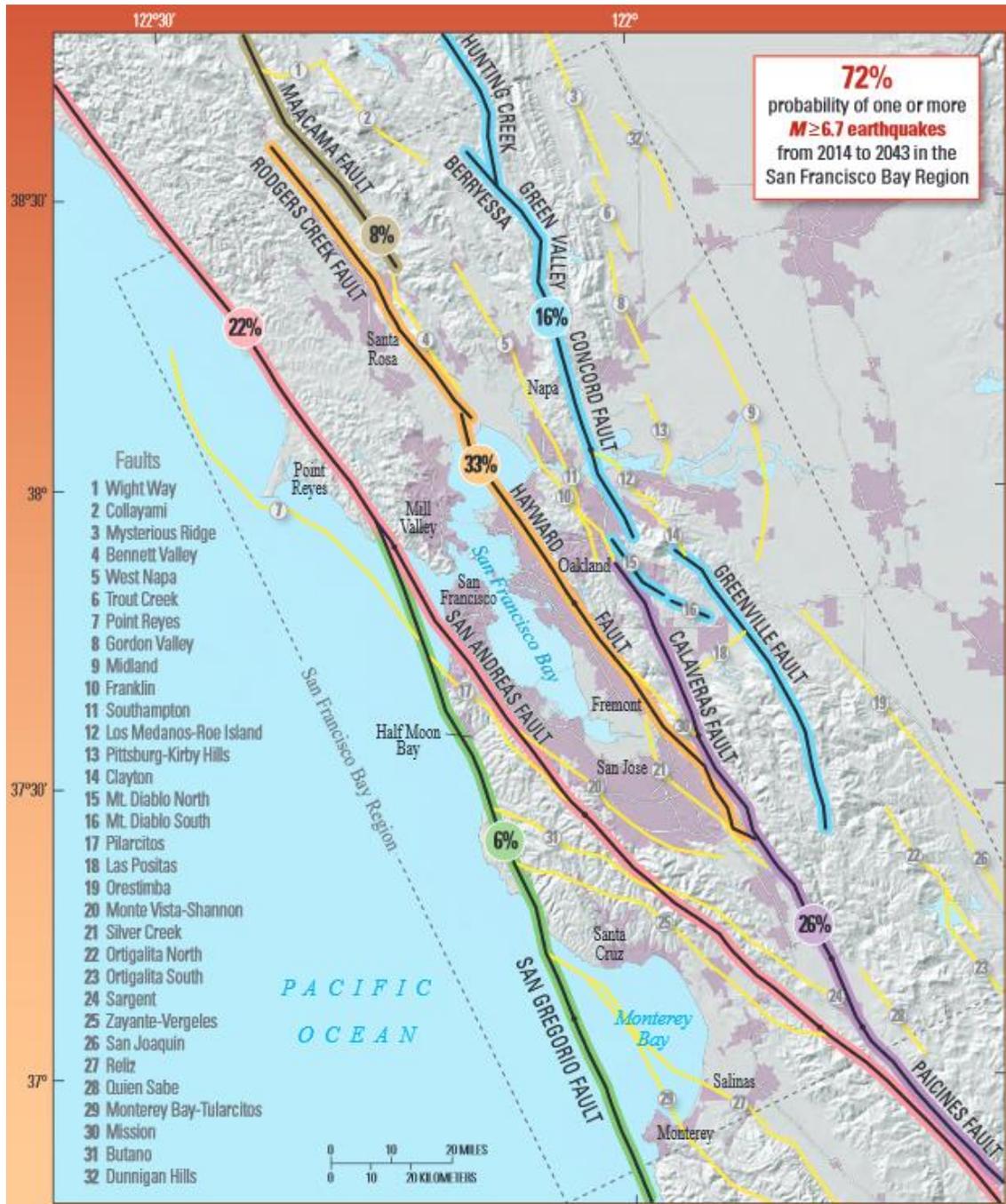
The San Andreas Fault, approximately 20 miles to the west of Santa Rosa, is the fastest-slipping fault along the plate boundary and the source of two magnitude 7.8 to 7.9 earthquakes in history, including the 1906 San Francisco earthquake, which destroyed much of downtown Santa Rosa, toppled City Hall, and killed at least 85 people; the city's population was approximately 7,000 at the time.

The Rodgers Creek Fault runs through the central part of Santa Rosa and was the source of two moderate earthquakes—of magnitudes 5.6 and 5.7, respectively—that struck below the north end of the city within a period of two hours on the night of October 1, 1969. Fortunately, no one died in the earthquakes, but many old commercial buildings downtown; homes in several residential neighborhoods; and a few modern, engineered buildings were all damaged. Although none collapsed, at least 74 buildings in the central business district sustained damage and about a third of those were beyond repair. The shaking toppled brick chimneys and broke windows over a wide area; locally, the earthquake ruptured water mains and buckled sidewalks and curbs. Total damage, including building contents, exceeded \$7 million (\$50.6 million in 2020 dollars).

Following the 1969 earthquakes, Santa Rosa established some of the strongest policies in the United States at that time, including Resolution 9820, adopted in 1971 and later repealed and reenacted in certain parts of City Code. The policies worked to address the problem of seismically vulnerable buildings using two approaches: (1) expanding the area of an existing federal urban renewal project to demolish and reconstruct a portion of the heavily damaged central business district, and (2) by creating inspection and abatement requirements to fix structural hazards elsewhere in the city. The City's conformance standards were flexible to limit the financial burden on property owners and to encourage rehabilitation rather than demolition of buildings that were undamaged, or only slightly damaged, in the 1969 earthquakes.

The City's strong commitment to mitigating structural hazards following these moderate earthquakes has helped reduce its vulnerability to future earthquakes; nonetheless, some significant hazards remain.

**Figure 7-5. Probability of a Magnitude 6.7 or Greater Earthquake Between 2014 and 2043 on Major Active Faults in the San Francisco Bay Region**



Source: USGS 2016.

## Fault Rupture, Creep, and Afterslip

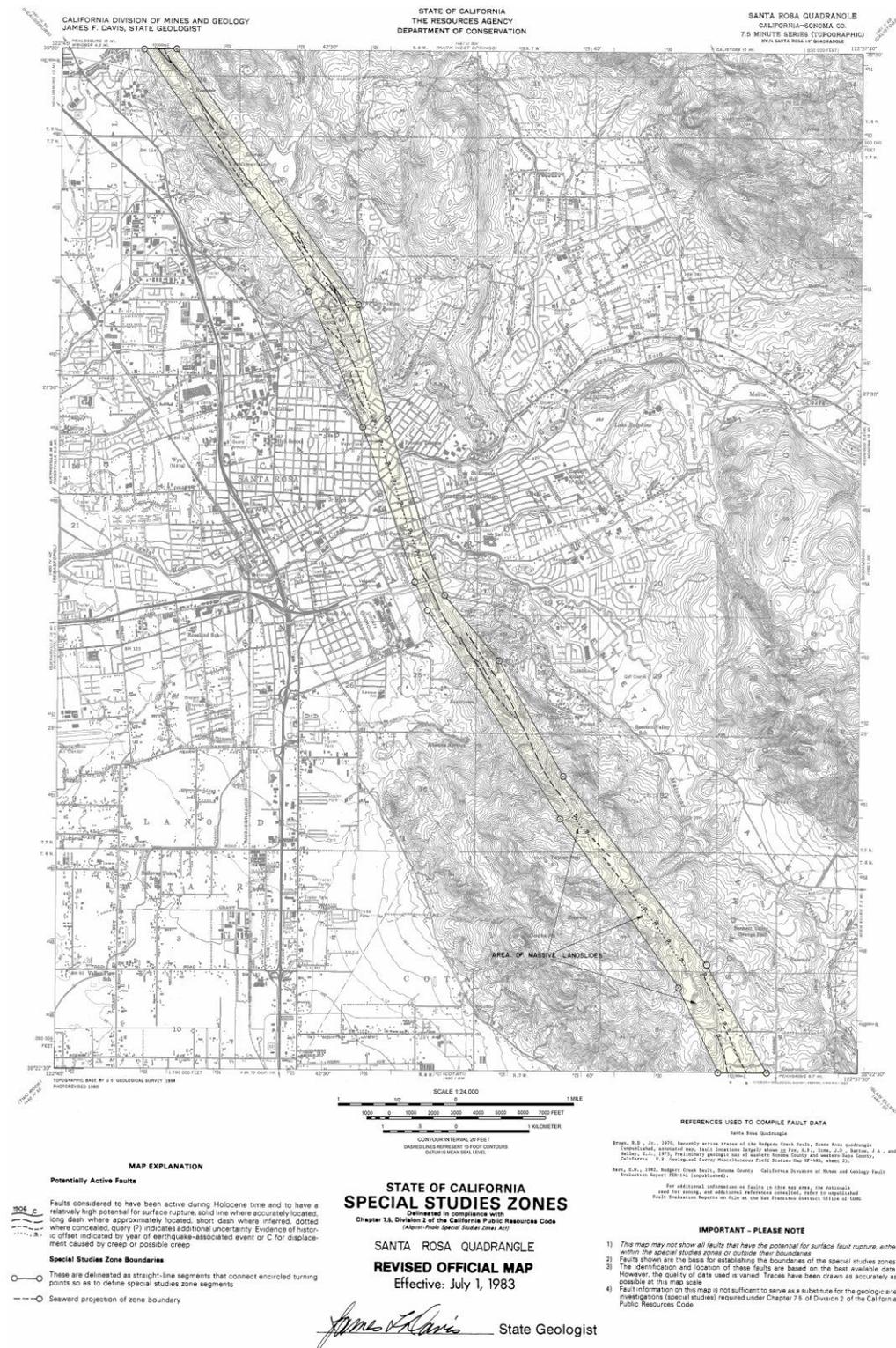
Actual movement and displacement of the ground's surface can occur along a fault boundary during an earthquake. The Rodgers Creek Fault Zone extends for over 43 miles and runs north to south through the center of Santa Rosa to the east of US 101 (see **Figure 7-6**). The two sides of the fault slip past each other at a rate of 6 to 10 millimeters per year and are capable of causing surface fault rupture within the city and the Urban Growth Boundary (UGB). The zone of potential concern for surface fault rupture in Santa Rosa covers 781 acres in the city and the UGB.

**Figure 7-6.** The Rodgers Creek Fault Scarp in Santa Rosa can be Seen as a Gentle Rise in the Street



Because the Rodgers Creek Fault Zone is an active fault trace and has the potential for surface rupture, it has been designated by the State Geologist as an Alquist-Priolo earthquake fault zone (see **Figure 7-7**). Alquist-Priolo earthquake fault zones are regulatory “Zones of Required Investigation” to reduce the threat to public health and safety and to minimize the loss of life and property posed by earthquake-triggered surface fault rupture. Cities and counties affected by the zones must regulate certain development projects within them and sellers of real property (and their agents) within a mapped zone must disclose that the property lies within such a zone at the time of sale.

Figure 7-7. Alquist-Priolo Earthquake Fault Zone Map for the Rodgers Creek Fault

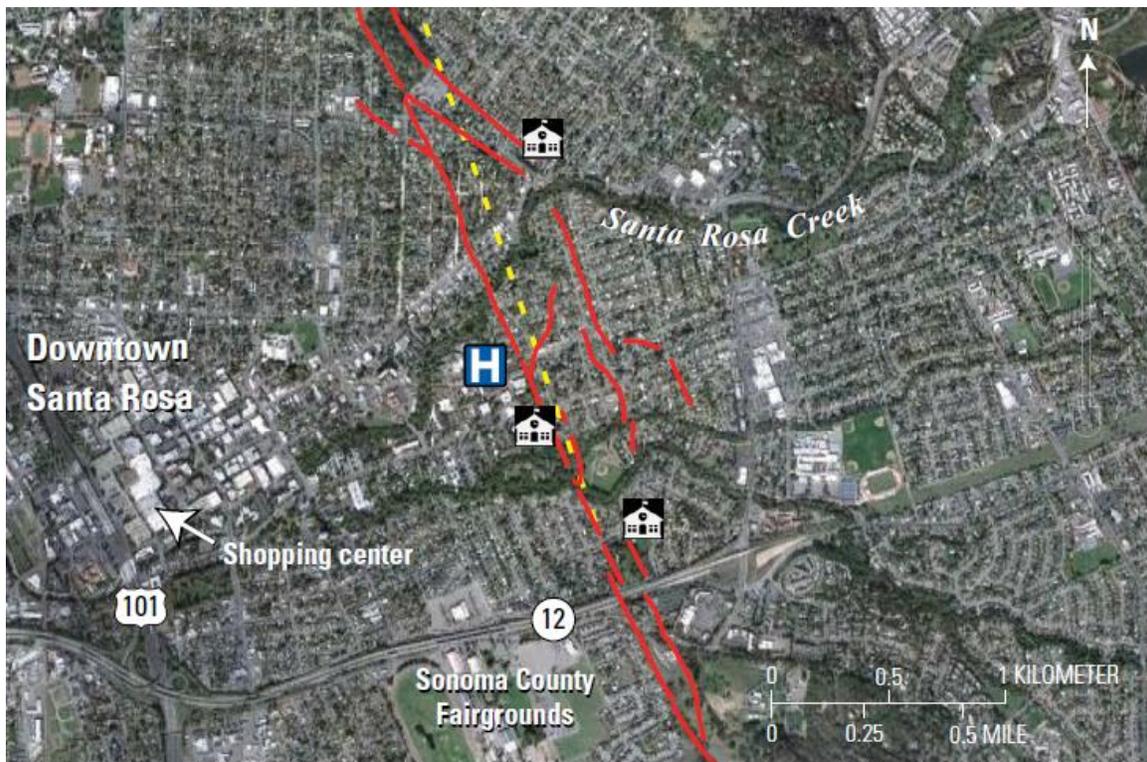


In 2018, the US Geological Survey (USGS) completed a more detailed and higher-resolution mapping study of the Rodgers Creek Fault in Sonoma County. Using aerial three-dimensional LIDAR (laser imaging radar) imagery, subtle landforms were identified on the Santa Rosa Creek floodplain indicating where past ruptures on the Rodgers Creek Fault had extended up to, and offset, the ground surface. Until this data was available, the exact location of the fault through central Santa Rosa had been obscured by urban development, trees, and other vegetation.

The study found that the zone of surface faulting is wider and more complex, and thus exposes a larger area to the possibility of damaging offsets in a major earthquake (see **Figure 7-8**). The fault extends about 10 miles farther north than previously thought to flank the east side of the town of Healdsburg. It also extends toward the Bennett Valley-Maacama Fault system to the east, and the Hayward Fault to the south beneath San Pablo Bay. The California Geological Survey is revising the Rodgers Creek Alquist-Priolo fault zones from Sears Point to Windsor to reflect recent research findings. The revised zone maps may be released as early as 2021 and could potentially expand the regulatory Zone of Required Investigation in Santa Rosa.

**Figure 7-8.** Google Earth Satellite Image of Central Santa Rosa (dated October 25, 2009) Showing the Surface Trace of the Rodgers Creek Fault in Red Lines.

*Yellow dashed line shows the previously inferred location of the fault across the Santa Rosa Creek floodplain. Building symbols mark the locations of schools close to the fault; the H represents a hospital complex.*



Altogether, the new research findings mean that the Rodgers Creek Fault can generate larger earthquakes and stronger ground shaking than previously thought. If the Rodgers Creek and

Hayward Faults act as one continuous fault system, then it could produce an earthquake as large as magnitude 7.4. If a magnitude 7.4 earthquake originated on the Rodgers Creek Fault Zone close to Santa Rosa, the subsequent damage and impacts across the city could be devastating.

Fault creep is the sliding of faults, constantly or episodically, in the absence of major earthquakes. It can be considered an alternate behavior to the stick-slip behavior that is thought to occur on most active faults. Since the portions of faults that creep are moving interseismically, rather than remaining locked, they accumulate less elastic strain energy than stick-slip faults and are likely to release less energy during an earthquake than a fault of the same size that did not creep interseismically. Recent studies using interferometric synthetic aperture radar (InSAR) confirmed that there is a creeping zone of approximately 12 miles along the Rodgers Creek Fault Zone extending northwest from Santa Rosa towards Healdsburg. The studies also concluded that the portion of the Rodgers Creek Fault Zone immediately southeast of Santa Rosa remains locked.

Post-seismic fault slip, or “afterslip,” can occur in association with co-seismic rupture, particularly on faults that were previously known to undergo surface creep and can be considered a hazard. Continued surface fault slip in the days or weeks that follow an earthquake can locally exceed the slip experienced during the earthquake, as observed in the 2014 South Napa earthquake. The prevalence of creep along the northern Rodgers Creek Fault Zone may imply a continuing afterslip hazard to fault-crossing infrastructure in the days or weeks following an earthquake in the area.

Climate change is not anticipated to have any effect on surface fault rupture, fault creep, or fault afterslip.

## Ground Shaking

Ground shaking is the primary cause of damage and injury during earthquakes. The Modified Mercalli Intensity Scale shown in **Table 7-4** measures ground shaking in terms of perception and damage and takes localized earthquake effects into account. The amount of shaking at specific sites varies based not only on the overall magnitude of an earthquake but also on the site’s distance from the earthquake source; underlying geologic conditions; and the construction, age, and design of buildings and infrastructure. The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural damage is generally of concern at shaking intensities with a magnitude of 6 and above.

**Figure 7-9** shows a ground-shaking scenario for Santa Rosa if a magnitude 7.1 earthquake originates on the Rodgers Creek Fault. Given the city’s proximity to the fault, shaking intensity levels are extremely high. Other earthquakes of lower magnitude on the Rodgers Creek Fault, or from more distant faults in the San Francisco Bay region, may not generate such high levels of shaking. However, as previously noted, this is not a worst-case scenario for the Rodgers Creek Fault Zone as new research indicates that the Rodgers Creek – Hayward Fault system is capable of generating up to a magnitude 7.4 earthquake.

Table 7-4: Modified Mercalli Intensity Scale for Earthquakes		
Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
Source: USGS 2020b		

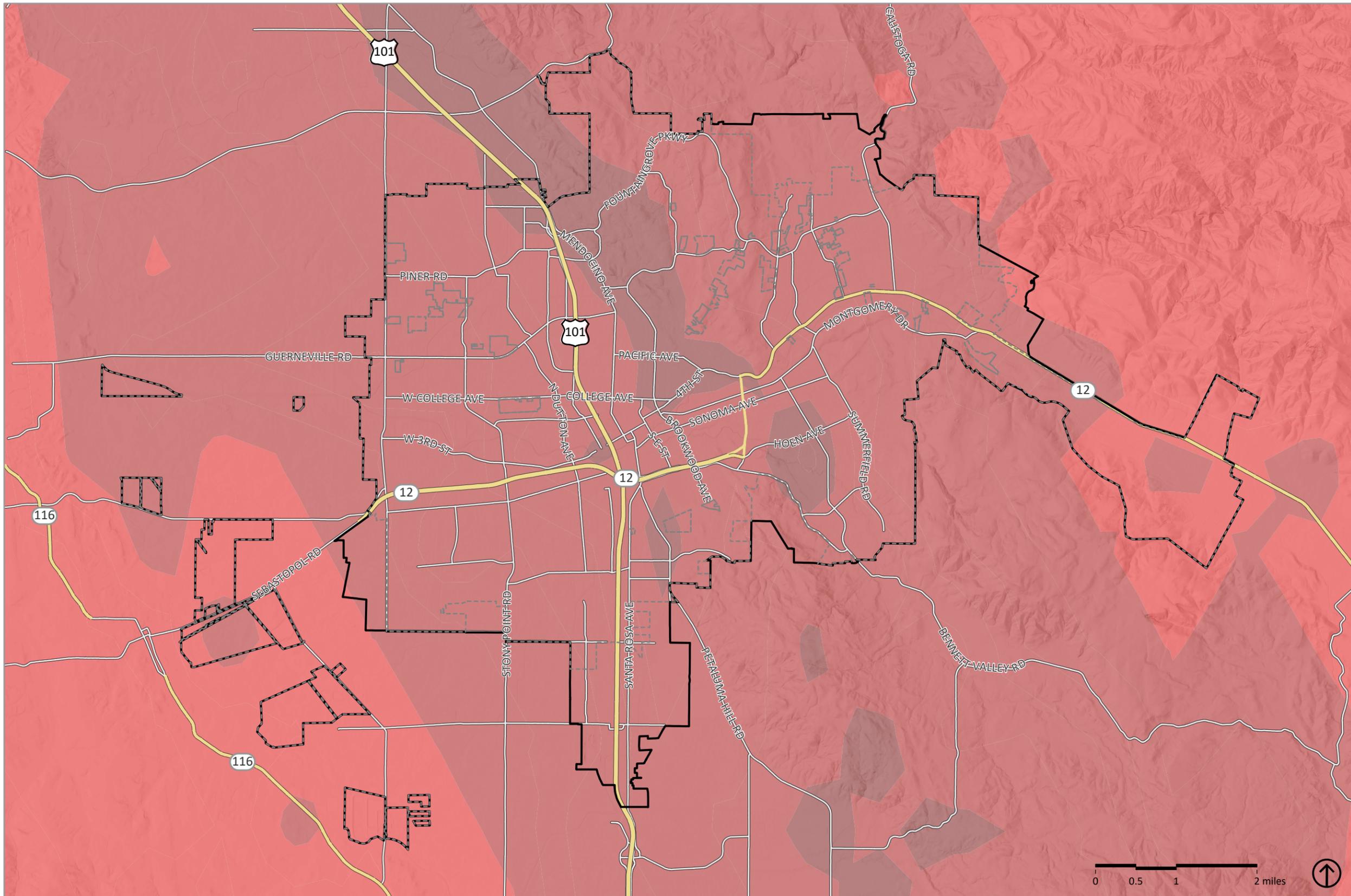


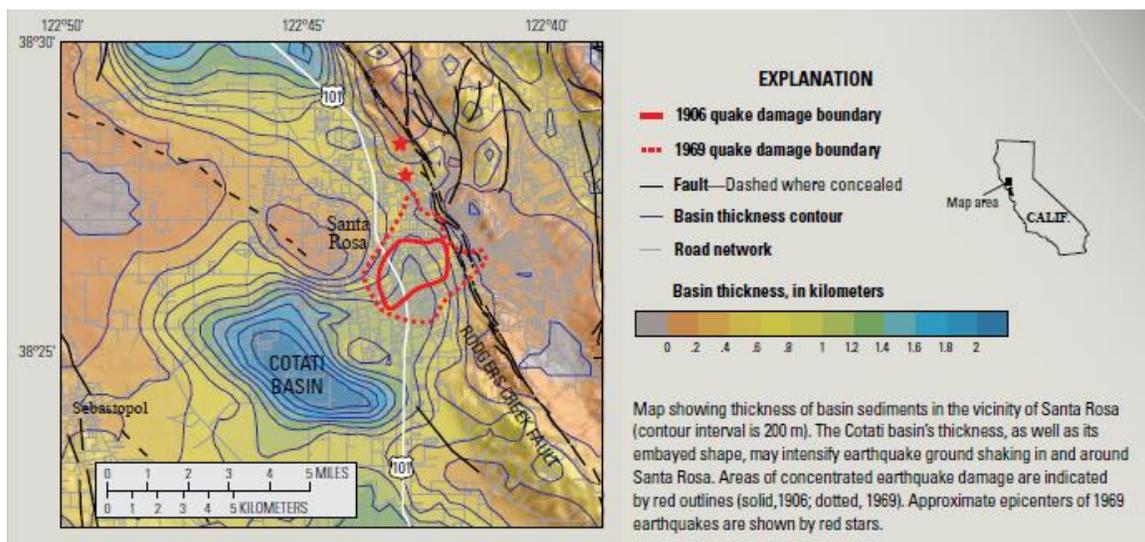
Figure 7-9  
**Ground Shaking Intensity**

Magnitude 7.1  
 earthquake scenario -  
 Rodgers Creek

- Shaking Intensity
- Moderate Shaking
  - Strong Shaking
  - Very Strong Shaking
  - Severe shaking
  - Violent shaking
  - Planning Area
  - City Limit

Recent studies of the underlying geologic structure of the Santa Rosa Plain discovered a very deep sedimentary basin, named the Cotati basin, beneath Santa Rosa on the southwest side of the Rodgers Creek Fault. The Cotati basin is filled with low-density, uncompressed sediments and deepens to more than a mile below the surface southwest of Santa Rosa. The basin likely played a role in focusing shaking damage in the 1906 and 1969 earthquakes. When seismic waves enter such a basin, they slow down and increase in amplitude, thereby increasing shaking intensities at the ground surface. Downtown Santa Rosa is located on the northeast edge of the Cotati basin and researchers believe that seismic waves from the 1906 and 1969 earthquakes may have been focused into this area and amplified at the basin's edge. Computer simulations of the effect of the basin on seismic waves from these earthquakes support these conclusions, demonstrating that the local basin structure plays a major role in shaping the distribution of damaging shaking in and around Santa Rosa (see **Figure 7-10**).

**Figure 7-10.** Thickness of the Underlying Geologic Basin Sediments in the Vicinity of Santa Rosa, and Areas of Concentrated Damage from the 1906 and 1969 Earthquakes



## Liquefaction

Liquefaction occurs when loosely packed sandy or silty soil deposits saturated with water lose their stiffness and load-bearing strength during earthquake ground shaking and can strongly affect the strength of earthquake shaking that is transmitted through the deposits and damage buried infrastructure, building foundations, and roadways. The risk of liquefaction depends on many factors, including the height of the groundwater table and the composition of the underlying soil.

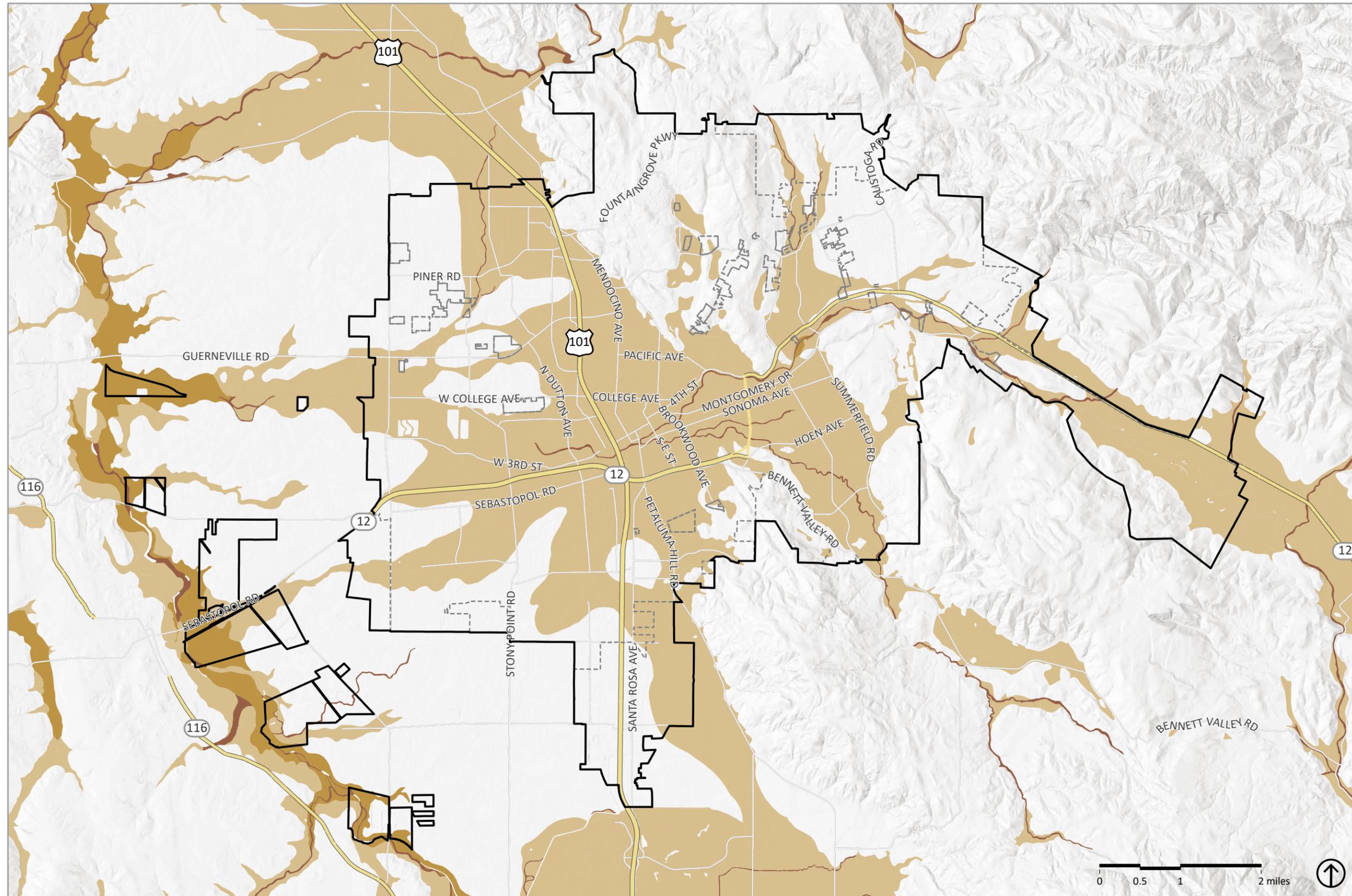
Liquefaction susceptibility in Santa Rosa is shown in **Figure 7-11**. The 2016 LHMP identified areas with a medium to very high liquefaction potential as part of the risk assessment. Most of Santa Rosa is at medium, low, or very low risk of liquefaction impacts in an earthquake. The area surrounding the Santa Rosa and Spring Creeks, however, is at high risk for liquefaction from the shallow groundwater in these areas.

Parts of Santa Rosa with an elevated risk of liquefaction may also be at risk from a phenomenon called lateral spreading, which occurs when soil undergoing liquefaction spreads horizontally across shallow slopes, much like a low-angle landslide. The phenomenon was a widespread occurrence along creek and riverbanks in the Canterbury region of New Zealand following the 2010 to 2011 earthquake sequence, severely damaging levees and nearby infrastructure and buildings.

The California Geological Survey (CGS) has not yet developed regulatory Zones of Required Investigation for liquefaction in Sonoma County under the Seismic Hazard Mapping Program. State Liquefaction Zones identify where the stability of foundation soils must be investigated and countermeasures that must be undertaken in the design and construction of buildings for human occupancy. State statutes require that cities and counties use these zones as part of their construction permitting process, and sellers of real property (and their agents) within a mapped zone must disclose that the property lies within such a zone at the time of sale. CGS plans to complete Liquefaction Zone mapping for Sonoma County, including Santa Rosa, when funding becomes available.

A changing climate can both increase and decrease liquefaction potential. Increased rainfall conditions can elevate groundwater tables. Conversely, extended periods of drought can decrease soil moisture and liquefaction risk.

Figure 7-11  
Liquefaction  
Susceptibility



- Very High
- High
- Moderate
- Planning Area
- City Limit

## Landslides

Landslides occur when soils on a hillside become unstable and slide down toward the base of the hill. They can occur very quickly or may unfold slowly over a period of days, weeks, months, or years. Landslides can damage or destroy any structures or infrastructure built on or in the moving soil, and the flow of material can cause further damage to any structure in its path.

Landslide risk depends on the types of earth materials of the hillside and the steepness of the slope. Landslides can be caused by different triggers, but the two most common are earthquake-induced landslides and moisture-induced (rain, flooding, irrigation) landslides. Earthquake-induced landslides can happen when the ground shaking makes the soil looser or when the slope fails, creating unstable conditions. Moisture-induced landslides can occur when the ground saturation causes a slope to weaken and become unstable. Water can also erode the base of slopes, making hillsides more unstable and increasing landslide risk.

Santa Rosa has experienced landslides in the past ranging from small, localized events to events that caused injury and substantial damage. On December 31, 2005, a mudslide on Montgomery Drive collided with houses and automobiles as it extended into the middle of the road. Two houses were damaged and a third was destroyed. The home that sustained the heaviest amount of damage also involved a person that was trapped alone for an hour and sustained minor injuries before being rescued by SRFD. An additional SRFD engine was sent to the end of Sullivan Court to evaluate the home above the slide, secure utilities, and evacuate residents at risk.

Decreased vegetation from wildfires can combine with excessive ground moisture from heavy rains to cause landslides. These conditions occurred in 1997 with the activation of the Hidden Acres landslide in the Bennet Valley area (outside of the Santa Rosa city limits). It was also a major concern following the 2017 wildfires with preventative actions taken to cover and protect exposed slopes in fire-damaged hillside areas of the city.

Landslide-prone areas in the city and the Urban Growth Boundary are depicted in **Figure 7-12** and broken down into three categories. “Mostly landslides” cover areas with the largest and most concentrated landslides; “few landslides” indicates smaller, more scattered landslides; and “flat land” is unlikely to have a landslide occurrence. Portions of the northern and southern reaches of the city have experienced few to many landslides. The landslide hazard for both earthquake- and moisture-induced landslides is increased with steep slopes located close to the Rodgers Creek Fault Zone.

Outside of these larger areas, localized landslides are possible along small slopes elsewhere in the city. These slopes include the sides of the Santa Rosa Creek and the Santa Rosa Flood Control Channel. Landslides in these areas are unlikely to cause substantial injuries or destruction but may result in limited damage.

The CGS has not yet developed regulatory “Zones of Required Investigation” for earthquake-induced landslides in Sonoma County under the Seismic Hazard Mapping Program. State Landslide Zones identify where the stability of hillslopes must be evaluated, and countermeasures undertaken in the design and construction of buildings for human occupancy. State statutes require that cities and counties use these zones as part of their construction permitting process,

and sellers of real property (and their agents) within a mapped zone must disclose that the property lies within such a zone at the time of sale. CGS plans to complete earthquake-induced Landslide Zone mapping for Sonoma County, including Santa Rosa, when funding becomes available.

Climate change is not anticipated to have any effect on earthquake-induced landslides, but it may result in more frequent and/or intense rainstorms increasing the risk of moisture-induced landslides in vulnerable parts of the community. Also, as the climate warms, soil conditions may become less stable from either drier conditions or excessive irrigation that could increase landslide hazards.

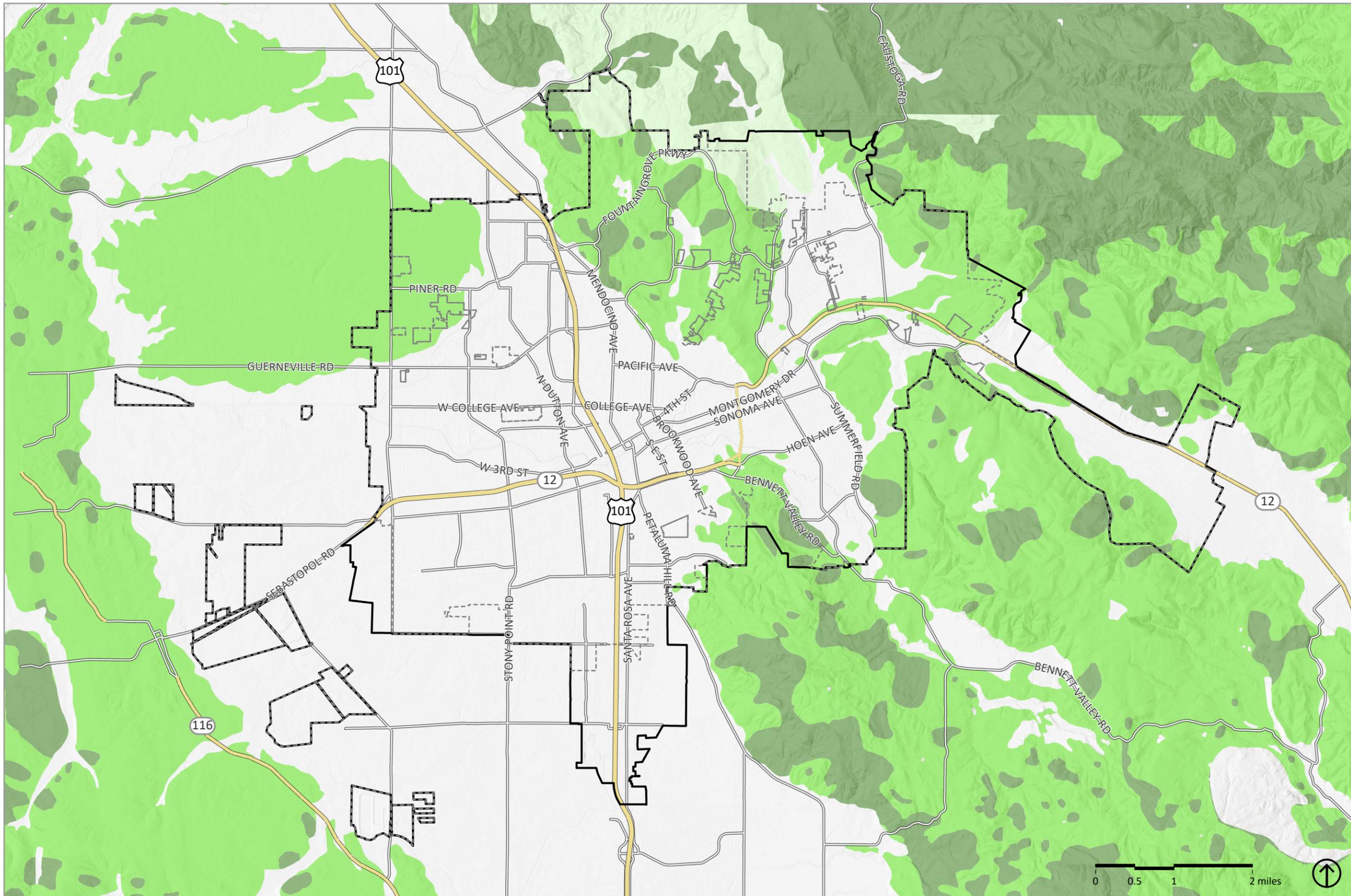


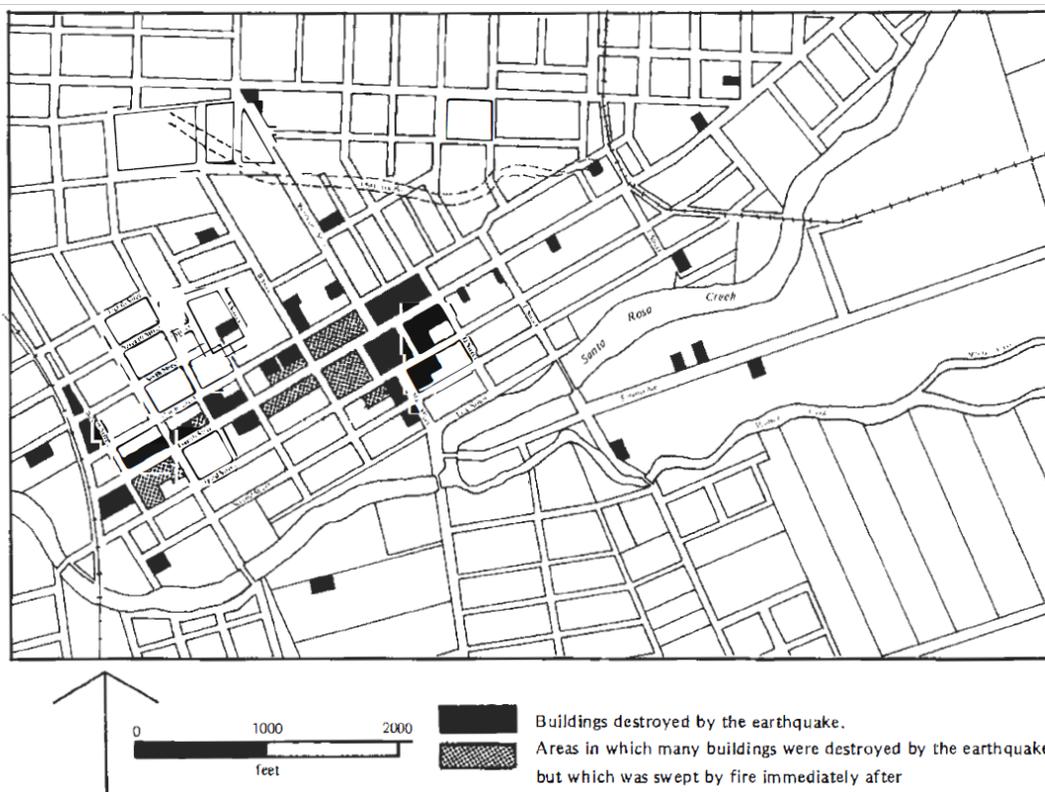
Figure 7-12  
Evidence  
of Past  
Landslides

- Many landslides
- Few landslides
- Flat land
- City Limit
- Planning Area

## Fire Following Earthquake

Fires occur following all earthquakes that significantly shake the built environment, but they are generally only a significant problem in urban areas predominantly composed of densely spaced wood buildings. Multiple simultaneous ignitions can lead to catastrophic conflagrations that ultimately may be the dominant cause of damage. A large earthquake combines all the necessary factors for major conflagrations that, depending on circumstances, can be uniquely catastrophic, such as the fire following the  $M_w$  7.8 earthquake in San Francisco in 1906. Fires also ignited in Santa Rosa following the 1906 earthquake burning buildings in the downtown area; see **Figure 7-13**.

**Figure 7-13.** Portion of Santa Rosa Showing Areas Destroyed by the 1906 Earthquake



In 2018, the USGS released the Engineering Implications report for the HayWired earthquake scenario, which examines a hypothetical magnitude ( $M_w$ ) 7.0 earthquake (mainshock) occurring on April 18, 2018, at 4:18 p.m., on the Hayward Fault centered in Oakland, California. An analysis of fire following earthquake for the scenario estimates that about 450 large fires would result in an ultimate burned area of approximately 79 million square feet of residential and commercial building floor area, equivalent to more than 52,000 single-family dwellings, and be directly responsible for the loss of hundreds of lives.

Fire following earthquake is a hazard that should be considered in future planning for earthquakes. Areas of older, wood-frame buildings in more densely developed residential neighborhoods near the city center are especially vulnerable. Changing climate conditions could also increase the risk of earthquake-triggered fires in the WUI and other highly vegetated areas of the city. Major mitigating factors include ensuring older wood-frame structures are adequately secured to their foundations, automatic gas shutoff valves are installed, water supply systems are resilient to earthquake hazards, and an auxiliary water supply for firefighting is in place.

## 7.6 FLOODING AND DAM INUNDATION

### Flooding

Flooding is a temporary condition in which land that is usually dry is wholly or partially inundated. Flooding occurs when water bodies, such as streams, rivers, lakes, or reservoirs, are abnormally high and overflow into adjacent low-lying areas. These areas are known as floodplains, defined by their exposure to the risk of recurring floods. Instead, flooding in the City is a result of heavy rains in low-lying areas with limited drainage and along creeks that are prone to flooding during 100-year storm events. Smaller, more frequent storm events have led to flooding and erosion in some of the City's creeks; however, FEMA has not yet mapped these potential events.

Floods can be powerful enough to move large objects swiftly into other objects, cause damage to buildings and infrastructure, and weaken foundations and soils. Secondary impacts of flooding, including saturated soils and erosion from flooding events, can cause trees to weaken and collapse, increasing the potential for property damage and loss of life. All these impacts make infrastructure more susceptible to sustained damage or collapse.

Santa Rosa has experienced flooding in the past. The most notable event occurred in January 2006, which involved flooding and landslides throughout the Russian River watershed. During this event, nearly 18 inches of rainfall occurred over seven days, causing the Laguna de Santa Rosa wetlands to reach peak capacity and overflow. These flooding conditions also caused surrounding creeks to experience erosion, sedimentation, and flooding.

In 2016, the City participated in the San Pablo Bay Watershed Discovery Project conducted by FEMA, which builds on the existing hazard mitigation efforts in the region, and if moved forward, would provide Santa Rosa and other communities with increased access to flooding-related data and mapping. It is important to note that this watershed only covers the very easternmost part of Santa Rosa in Oakmont, affecting a small number of properties.

Before this, in 2011, sections of southwestern Santa Rosa were surveyed and mapped by FEMA to identify flood hazard zones. These maps provided residents and property owners with better information regarding flood risks and hazards. A critical asset located in this portion of the city, and exposed to increased flood risk, is the Regional Water Reuse System, which provides wastewater treatment for the region.

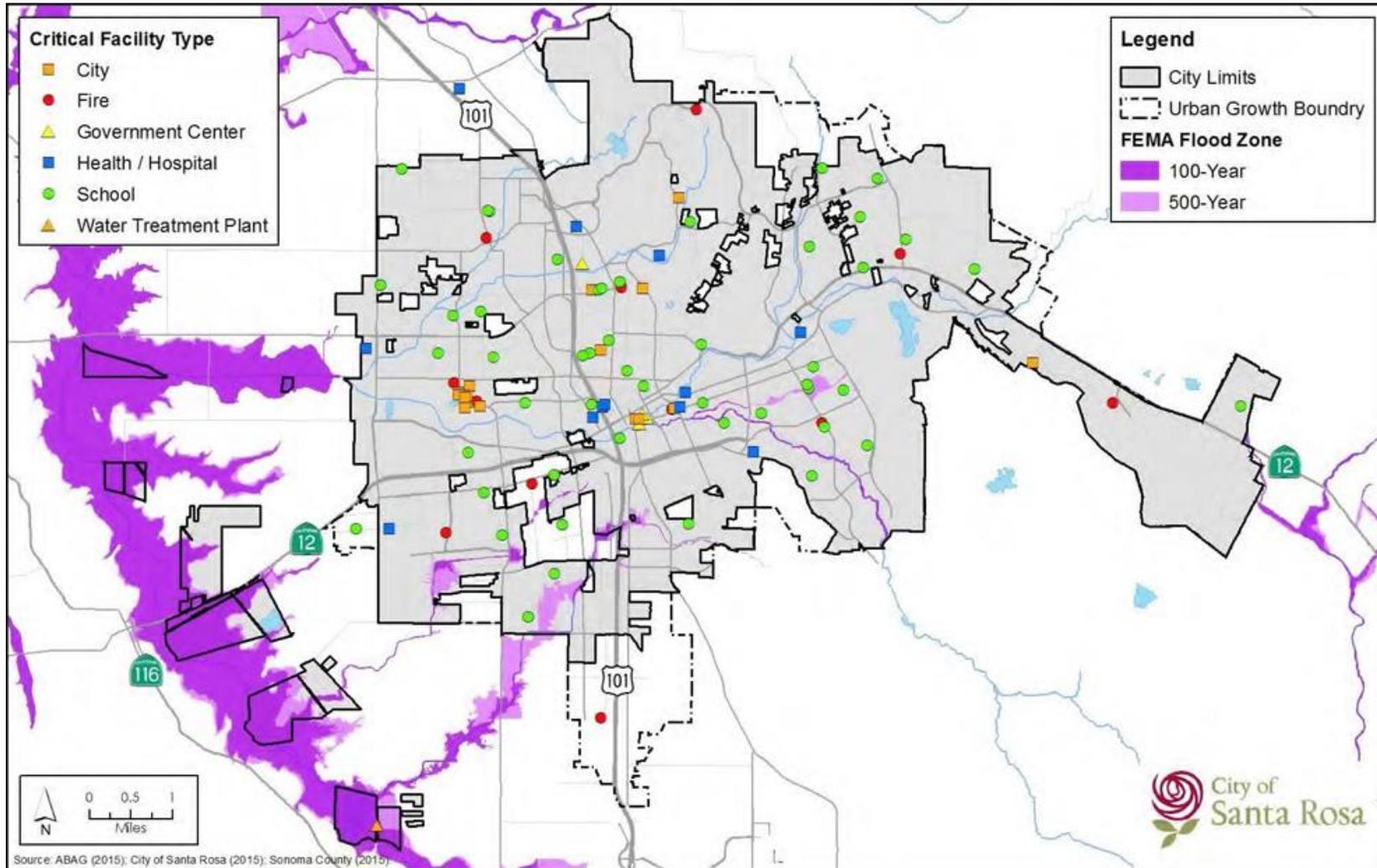
According to FEMA floodplain mapping, several 100- and 500-year flood zones are located throughout Santa Rosa, predominantly along creeks and drainages that are prone to flooding during heavy rains. **Figure 7-14** shows these flood zones, which surround portions of Spring Creek, Matanzas Creek, Colgan Creek, Naval Creek, Roseland Creek, and Kawana Springs Creek. As a participant in the NFIP since 1974, properties within these flood zones are eligible to purchase flood insurance through FEMA. Approximately 167.71 acres in Santa Rosa's UGB are in the 100-year flood zone and 283.99 acres are in the 500-year flood zone. Structures located within these areas, as well as near creeks and drainages that are prone to flooding, are at greatest risk of impact associated with flooding.

As a participant in the NFIP, Santa Rosa has 115 structures enrolled in the program, which has paid 25 losses, totaling over half a million dollars. Two of these paid losses were characterized as substantial damage and have initiated on-site mitigation solutions to reduce future flood damage. Of these structures, five have been identified as repetitive loss properties. Repetitive loss properties are those that have suffered more than one insured flood loss, indicating that the risk of flooding may be a systemic issue.

Future risk of flooding varies across the city and will be impacted by climate change. Flooding in Santa Rosa occurs in different ways between the northern and southern portions of the city. Northern Santa Rosa is expected to experience minimal flooding since the distribution of creeks is greater in this part of the city. The flatter portions of the city (southern Santa Rosa), along with fewer creeks make this part of the city prone to flooding. Roseland and Colgan Creeks receive most of the stormwater drainage from southern Santa Rosa and have been identified for restoration activities as part of the Citywide Creek Master Plan. Based on this Master Plan, these drainages will require improvements to minimize future risk of flood hazards. In addition, continued erosion along natural drainages throughout the City may cause weakening banks, undermining beneath existing infrastructure, which could lead to failure. Given the nature of the storm drain system within the City, flooding is anticipated to occur in the future, especially in the southern portions of the City.

Overall precipitation is expected to decline within the region due to climate change. However, it is possible that more frequent intense storms may occur, resulting in an increased risk of flooding. With projected climatic conditions, it is anticipated that prolonged periods of drought will be coupled with heavy rains in a short period, rather than rainfall throughout the year (City of Santa Rosa 2016). More intense storms can exceed the capacity of soils, water bodies, and stormwater infrastructure to accommodate storm flows. If precipitation levels decline in Santa Rosa and drought conditions become more frequent, soils are likely to become drier with a reduced capacity to absorb water, which could exacerbate flooding.

Figure 7-14. FEMA 100- and 500-Year Flood Zones



### *Flood Management Currently in Place*

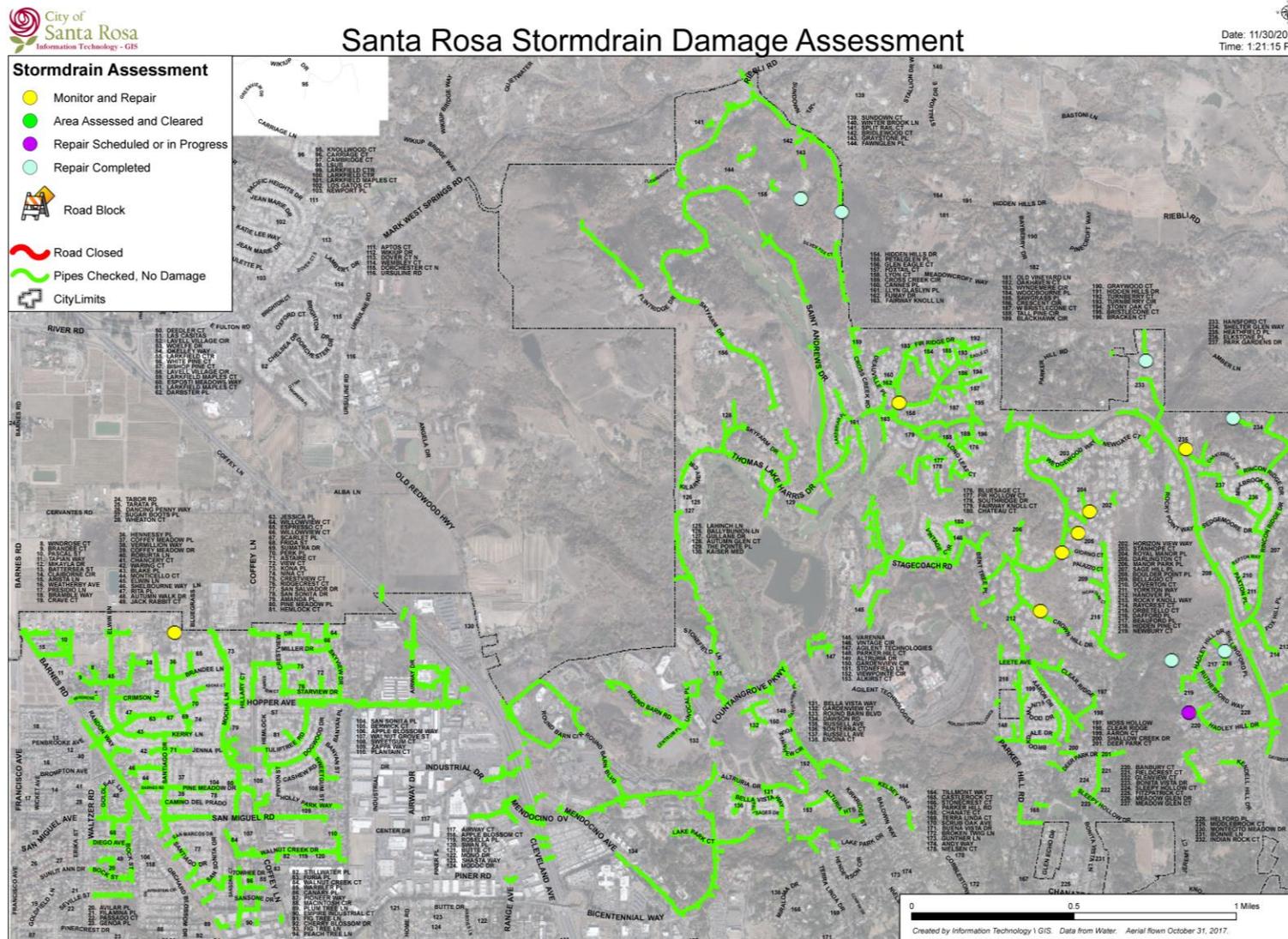
Stormwater runoff in Santa Rosa is collected and conveyed through an integrated system of detention facilities, curbside gutters, underground pipelines, drainage ditches, and creeks. The design of the city's stormwater system is intended to minimize potential downstream impacts, such as erosion or flooding. The Santa Rosa Municipal Code (Chapter 17-12) regulates the design and construction of stormwater management facilities throughout the City.

Stormwater generated in Santa Rosa drains through several major creeks to the Laguna de Santa Rosa. The largest is Santa Rosa Creek, which drains the northern area of the City. Four creeks (Brush, Austin, Spring, and Matanzas) drain primarily the eastern portion of the City, while Paulin and Piner Creeks drain the western portion of the City. The southern portion of the City is drained by Colgan and Roseland Creeks, which is more susceptible to flooding, based on the amount of area within the drainage and close to the Laguna De Santa Rosa. The Santa Rosa Creek Master Plan recommends habitat preservation, enhancement, restoration projects, and improvements to the City's creeks and trail system. Several of these creeks are identified for future improvement/enhancement.

Stormwater discharge and maintenance activities are monitored and regulated as part of the City's Stormwater Management Program and National Pollutant Discharge Elimination System permit. General Plan policies support the construction of storm drain improvements, stormwater detention and infiltration areas, and erosion-reduction measures to preserve operational drainage system capacity.

Unfortunately, the 2017 Tubbs Fire destroyed a significant amount of flood management infrastructure in the wildfire impacted areas. After the wildfires, the City assessed storm drainage infrastructure, which identified sections of underground pipelines destroyed by the fire in the Fountaingrove area. These impacted pipelines were constructed with High-Density Polyethylene piping that caught fire and were destroyed. The resulting damage included missing sections of storm drain piping, resulting in underground voids and cavities that could cause sinkholes, debris, mudflows and/or flash flooding concerns. **Figure 7-15** identifies the results of the post-fire assessment of the storm drain damage. Locations in green are pipelines that are not damaged, whereas all other locations identified have some form of impact that needs to be addressed.

Figure 7-15. Santa Rosa Storm Drain Damage Assessment



## Dam Inundation/Failure

Dam inundation occurs when a flood control dam/water reservoir is damaged severely enough to compromise its ability to impound water behind the structure. While rare, this hazard has the potential to impact communities significantly, threatening lives, destroying structures and critical infrastructure, and further decreasing available water supply. Dam failure can occur from earthquakes or other seismic activity, erosion of the dam face or foundation, rapidly rising floodwaters that weaken the dam or overwhelm its capacity to drain excess water, or flaws in the ground on which the dam rests. Human error, such as design or operation failures, can also result in dam failure and inundation. When a dam fails, sudden fast-moving floodwaters migrate throughout the inundation area beneath the dam. The sudden release of these floodwaters can damage or destroy property, cause injury or loss of life, and displace residents and businesses in the flood's path. A dam failure event can also damage regional infrastructure such as transportation and energy networks, impacting residents, and systems outside of the flood's immediate path. **Figure 7-16** shows the locations of dams within the City and surrounding areas that have the potential to inundate portions of Santa Rosa.

The risk of dam inundation is more limited than other hazards, but a sizeable portion of Santa Rosa remains susceptible to this hazard, as shown in **Figure 7-17**. There are 25 critical facilities located in an area at risk of dam inundation.

Dam failure events are infrequent; however, these events can still occur. Dam facilities are built to meet exceedingly high safety standards, are designed with failure-stopping redundancies in mind, and have a significant amount of oversight from federal and State regulatory agencies. During floods, dam operators will often increase water releases from the dam to reduce the risk of exceeding dam capacity from the influx of water from upstream areas. To date, the City has not experienced a dam failure incident, nor has the greater Bay Area (ABAG 2015). The most recent dam failure-related incident to occur in California was the Oroville Dam spillway failure that occurred in February 2017.

Given the considerable amount of scrutiny dedicated to dams and levees since the Oroville Dam incident, dam owners/operators have a better understanding of the risks associated with these facilities. Based on this, it is assumed the likelihood of dam failure for the dams within and surrounding the City should remain low. However, a triggering event, such as a large earthquake, could result in a dam failure event.

Increased storm intensity is expected to increase flooding potential, which could increase the rate of erosion around dams, require increased amounts of discharge, and/or place strain on dam infrastructure, increasing the risk of failure.

Figure 7-16. Dam Inundation and Failure

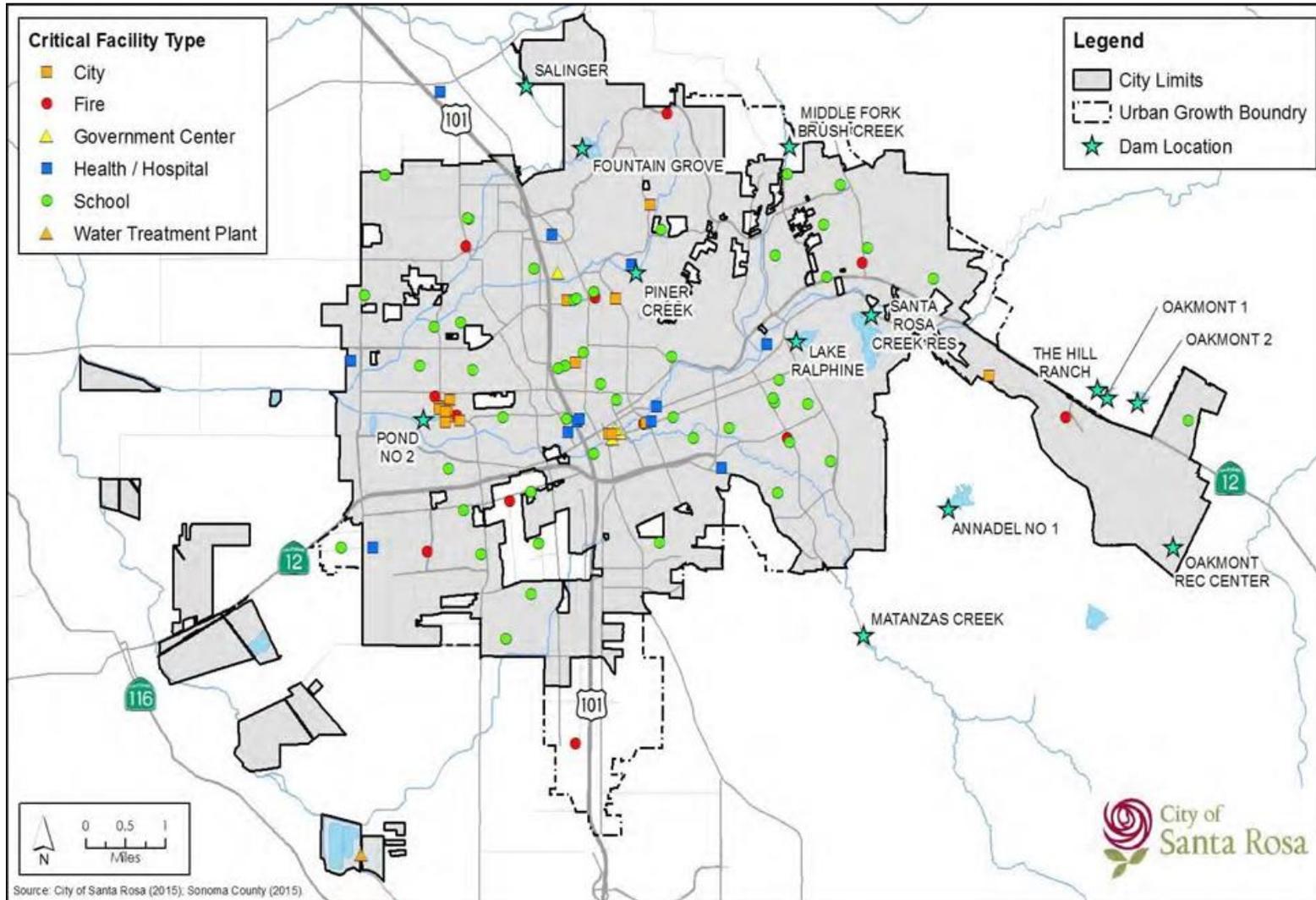
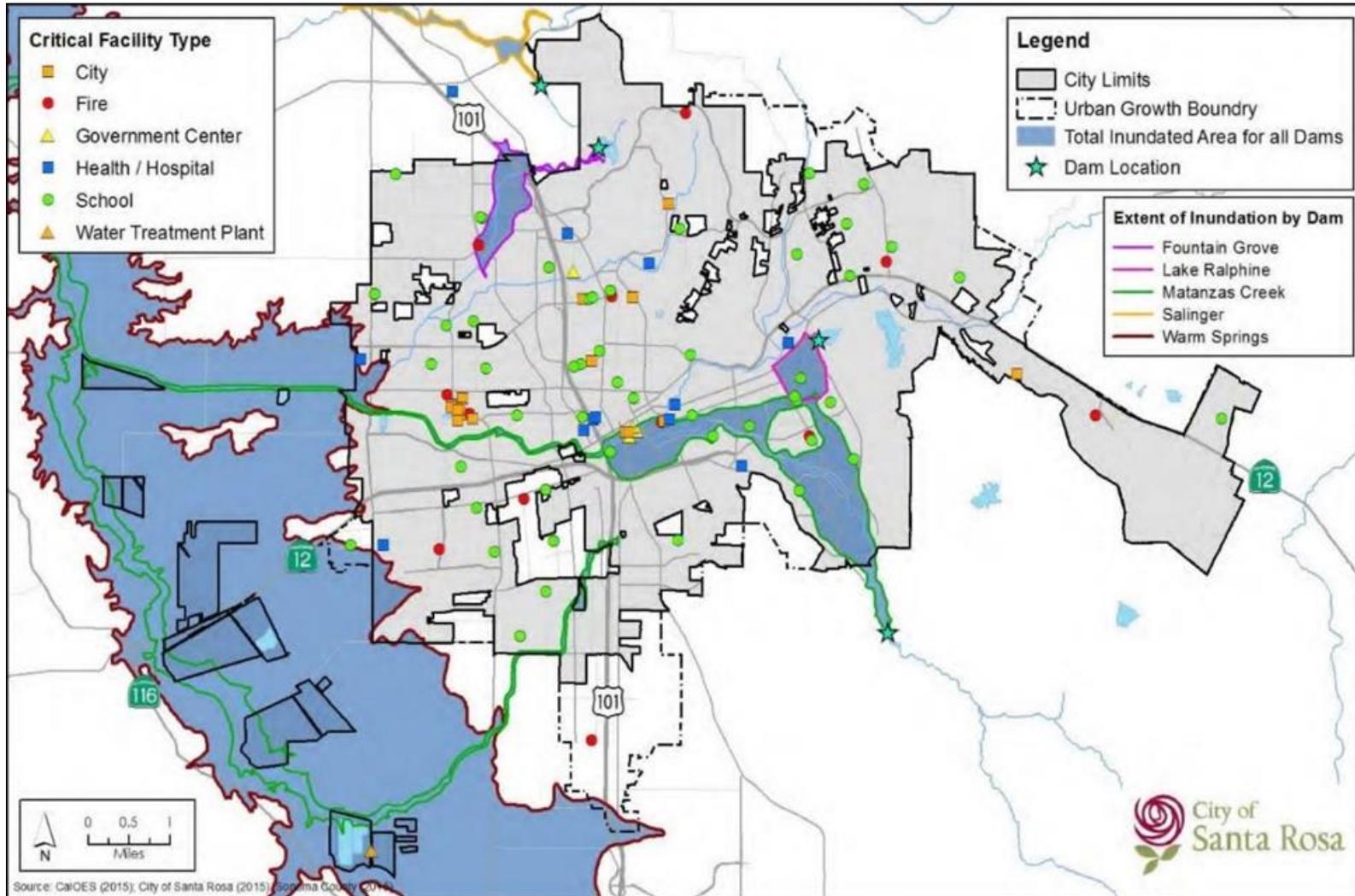


Figure 7-17. Dam Inundation Areas



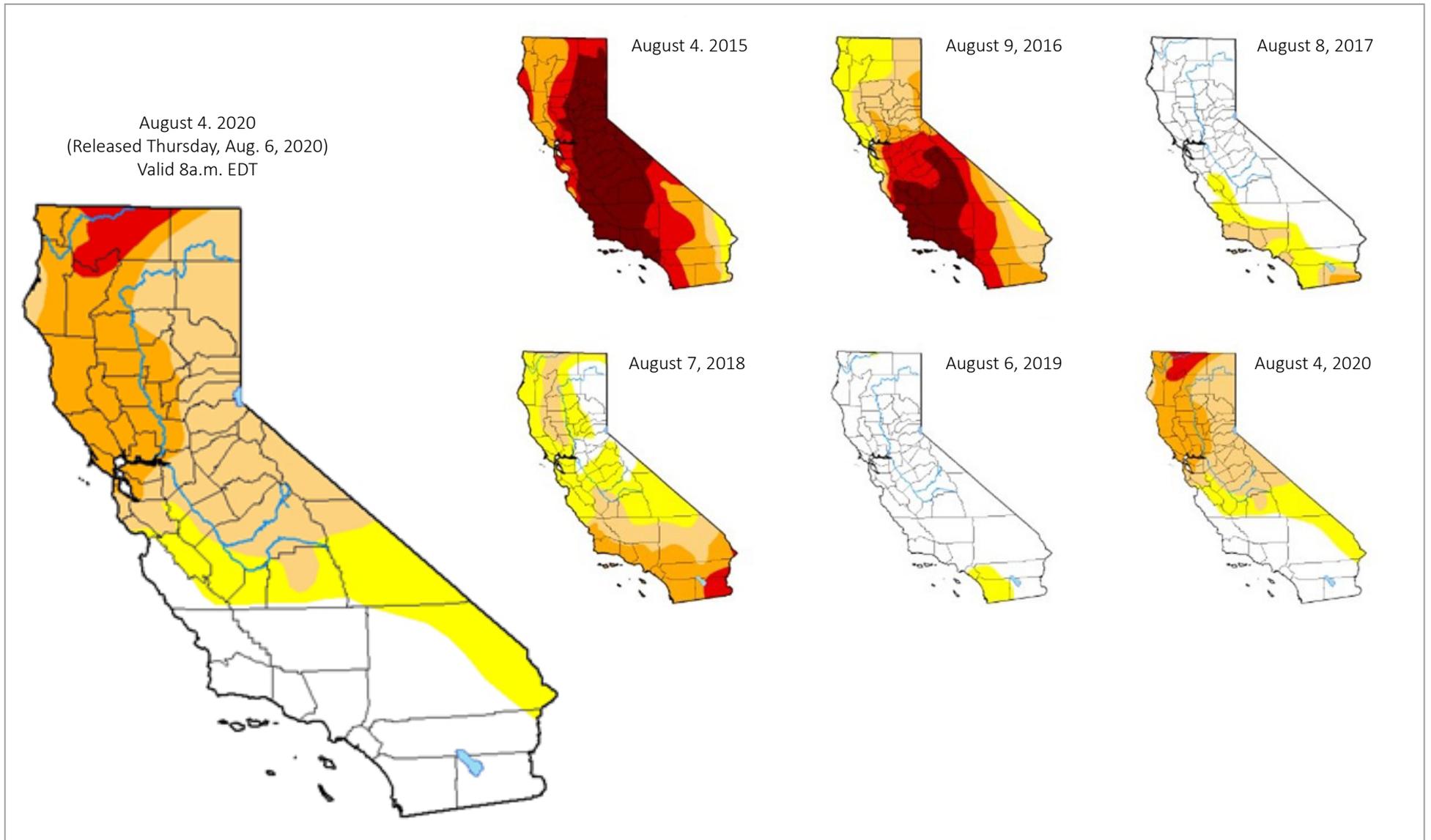
## 7.7 DROUGHT

A drought is a long-term shortage of water, usually caused by an extended lack of precipitation, while “drought conditions” denote periods with little or no precipitation. Unlike hazards that occur suddenly, droughts develop over time. In some cases, the effects of a drought may not be felt for several years, and multiple wet years may be necessary to alleviate drought conditions.

In urban areas, drought conditions can cause a decrease in available water supplies, which may lead to mandatory water conservation and water-use restrictions. Depending on the length and severity of drought conditions, some communities may need to seek alternative water supplies, and vegetation, including street trees, landscaping, and open space can become stressed, which can allow for invasive pests and species to harm vegetation.

In natural areas, drought conditions can also lead to reduced vegetation growth or drier vegetation, which can increase wildfire risk and allow for greater introduction or expansion of non-native plants, animals, and pests. Agricultural areas may also be impacted by drought conditions, which can result in crop losses. If these conditions persist for prolonged periods, soil conditions can change, leading to increased potential for flooding and erosion as drier soils are unable to absorb water when precipitation returns.

Santa Rosa and surrounding Sonoma County have experienced the effects of droughts declared statewide in 1976–1977, 1987–1991, and 2011–2019. Even with the prolonged length of the most recent event, City-instituted demand-reduction strategies avoided a local water supply shortage. **Figure 7-18** illustrates drought conditions in California each August from 2015 to 2020. Current statewide forecasts indicate that extended dry-weather periods will become more frequent and severe. Santa Rosa’s 2015 Urban Water Management Plan (UWMP) is currently being updated and will be released in 2021. The updated UWMP will include actions needed to address potential future water supply reductions.



### Legend

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*Author:*  
Brian Fuchs  
National Drought Mitigation Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

Figure 7-18  
**Drought Conditions within California**

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

## 7.8 OTHER CLIMATE-RELATED HAZARDS

The Santa Rosa Planning Area has a Mediterranean climate characterized by warm summers and relatively mild, yet wet, winters. Such weather supports a wide range of biodiversity and contributes to a thriving agricultural region. However, biodiversity and success in agriculture is dependent on relatively predictable weather patterns and the Santa Rosa Planning Area is located in an area susceptible to climate change-related weather fluctuations (California Natural Resources Agency 2019, p. 9). These weather fluctuations include extreme weather events such as extreme heat, severe winter storms, wind, and intense rain. These fluctuations can result in impacts that can be small or large in scale, ranging from damage to structures to injury or death of humans, plants, and animals. Such damage can occur in the Santa Rosa Planning Area, especially as the frequency of weather fluctuations increases due to climate change.

This section describes how climate change could affect long-term future impacts to the Santa Rosa Planning Area through increased frequency of extreme weather events that will result in impacts to humans, animals, and agricultural operations, which include crops and livestock.

### Extreme Heat

Extreme heat events are days where high temperatures significantly exceed normal levels (CEC 2020). During extreme heat events, temperatures can reach dangerously high levels, which can negatively impact humans, plants, and animals, particularly in cases where there is limited or no access to sufficient water and/or air-conditioning facilities. Extreme heat, particularly prolonged exposure to extreme heat, can cause dehydration, heat stroke, or death in more severe instances. Some populations are more vulnerable to extreme heat due to physiological conditions, socioeconomic status, or increased exposure. Such physiological impacts can disproportionately impact children, seniors, and those with existing cardiovascular conditions. Socioeconomic status plays a role in extreme heat-related impacts, particularly in lower-income communities where residents may not have air conditioning in their homes or who may work outdoors. Some populations are more prone to extreme heat exposure, such as outdoor workers, athletes, and children. Prolonged exposure to extreme heat can also impact plants and animals, such as farm animals in outdoor pens or fields, and outdoor plants ranging from small gardens to large agricultural fields. These plants and animals are particularly vulnerable in the absence of adequate shelter or water.

The annual average maximum temperature in the Santa Rosa Planning Area is around 73.5°F between 1961 and 1990. This annual average maximum temperature in the Santa Rosa Planning Area is anticipated to increase to approximately 79°F, an increase of 5°F (CEC 2020). The Santa Rosa Planning Area has seen record-breaking extreme heat days and subsequent days of extreme heat, known as a heat wave. The portions of Sonoma County that are anticipated to have a greater increase in the frequency of extreme heat days are along the Sonoma County valley floor along Highway 101 through the Santa Rosa Planning Area (County of Sonoma, Regional Climate Protection Authority 2014). In the Santa Rosa Planning Area, an extreme heat day is one with a high temperature above approximately 93°F (CEC 2020). Between 1961 and 1990, there were four observed extreme heat days per year, a figure expected to increase to 15 times a year by the end of the century.

A future increase in temperatures is expected to contribute to longer and more severe California droughts, which could create significant challenges for water supplies, natural ecosystems, and agricultural operations throughout California. Although there is not a significant amount of agricultural land uses within the Santa Rosa Planning Area, agriculture activities in Sonoma County, including both crops and livestock, generated \$1.1 billion in 2018, and are a key component of the area's economy (County of Sonoma Department of Agriculture/Weights and Measurements 2018, p. 1). The potential impacts to agricultural activities are vast:

**Warming temperatures** mean that many weeds and pests, which only survive in warmer climates, can now survive in more locations and an increase in the growth of weeds could reduce or eliminate a crop harvest due to competitions for light, water, and soil nutrients.

**Extreme heat**, particularly prolonged periods of extreme heat over several days (heat waves), can cause wet soil to crust and compact, stunting root development and ruining crops. Heat waves can also devastate livestock farms as heat stress can affect animals both directly and indirectly, including leading to heat stroke or death, increasing the risk of disease and reduced fertility, and in the case of dairy cows, potentially reducing milk production (EPA 2016).

### Extreme Winter Storms, Wind, and Rain

Climate change is expected to result in severe fluctuations from extreme heat to extreme storms, wind, and rain events. Extreme storms often include rain and can cause lightning events that can spark wildfires or disrupt electrical systems. Extreme storms can also include severe wind events that may damage power transmission lines and cause serious injury or death. Extreme instances of storms with regionally or locally intense rainfall can result in the release of water-borne diseases, strain on infrastructure, injury, or death (California Natural Resources Agency 2018, p. 61).

The region's largest storms will likely become more intense, and potentially more damaging, in the coming decades (California Natural Resources Agency 2018, p. 6). Precipitation in the Bay Area region is anticipated to remain relatively constant on average, but with greater year-to-year variability, causing an increase in the number of very wet or very dry years. Atmospheric rivers, which are narrow corridors of moisture in the atmosphere resulting in extreme rainfall events, are likely to become more intense and more damaging in the coming decades. Historically, the Santa Rosa Planning Area has averaged approximately 38 inches of rain annually.

Extreme storms, wind, or rain can be devastating to agricultural operations. Increased periods of extreme storms and locally intense rainfall events can destroy entire fields by flooding, either killing off existing crops or preventing planting. The range and distribution of weeds, pests, and pathogens are anticipated to increase as climate change causes wetter conditions, impacting crop growth as well as livestock that may become infected with diseases at a higher rate.

## 7.9 HAZARDOUS MATERIALS

In California, a hazardous material is defined as:

“A substance that, because of physical or chemical properties, quantity, concentration, or other characteristics, may either (1) cause an increase in mortality or an increase in serious, irreversible, or incapacitating illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed” (California Health and Safety Code, Section 25141b).

Hazardous materials are a wide-ranging category of substances that include toxic substances, flammable or explosive materials, corrosive substances such as acids, and radioactive substances. While some hazardous materials are dangerous at all times, others may only be dangerous under specific conditions (flammable materials, for example, which may be perfectly inert and harmless until exposed to a spark or a heat source). Hazardous wastes refer to hazardous materials that are no longer used and have been disposed of or are awaiting disposal.

The State of California has designated the City’s Fire Department as CUPA for hazardous materials regulatory enforcement. The Fire Prevention Bureau is responsible for hazardous materials, hazardous waste program management, hazardous materials enforcement, and oversight of contaminated soils remediation, including underground and aboveground storage tanks containing hazardous materials and petroleum products. The Fire Department Hazardous Materials Response Unit responds to hazardous materials spills within the city when they occur.

A variety of locations within the city use, store, manufacture, and dispose of hazardous materials. Many facilities include dry cleaners, automotive repair shops, and commercial businesses that use regulated materials as part of daily operation. The City also has a variety of industrial facilities that contain significant quantities of hazardous materials. These stationary locations are at risk of releasing hazardous materials from human error (the most common occurrence), or a natural hazard event (earthquake, flood, landslide).

In addition to stationary sources, there is a risk of release associated with the transport of hazardous materials. Vehicles transporting hazardous materials along major corridors, such as US 101 and SR 12, are of concern due to the high volume of cars and goods. The movement of goods along the Northwestern Pacific Railroad may also be a location of concern regarding hazardous materials release.

According to the DTSC, 44 sites within the City have required investigation and/or cleanup activities due to a concern of hazardous materials. As the City’s CUPA, the Fire Department also maintains an inventory of approximately 650 locations in Santa Rosa, which include the regulation of hazardous materials used for daily operations. **Figure 7-19** identifies these locations throughout Santa Rosa.

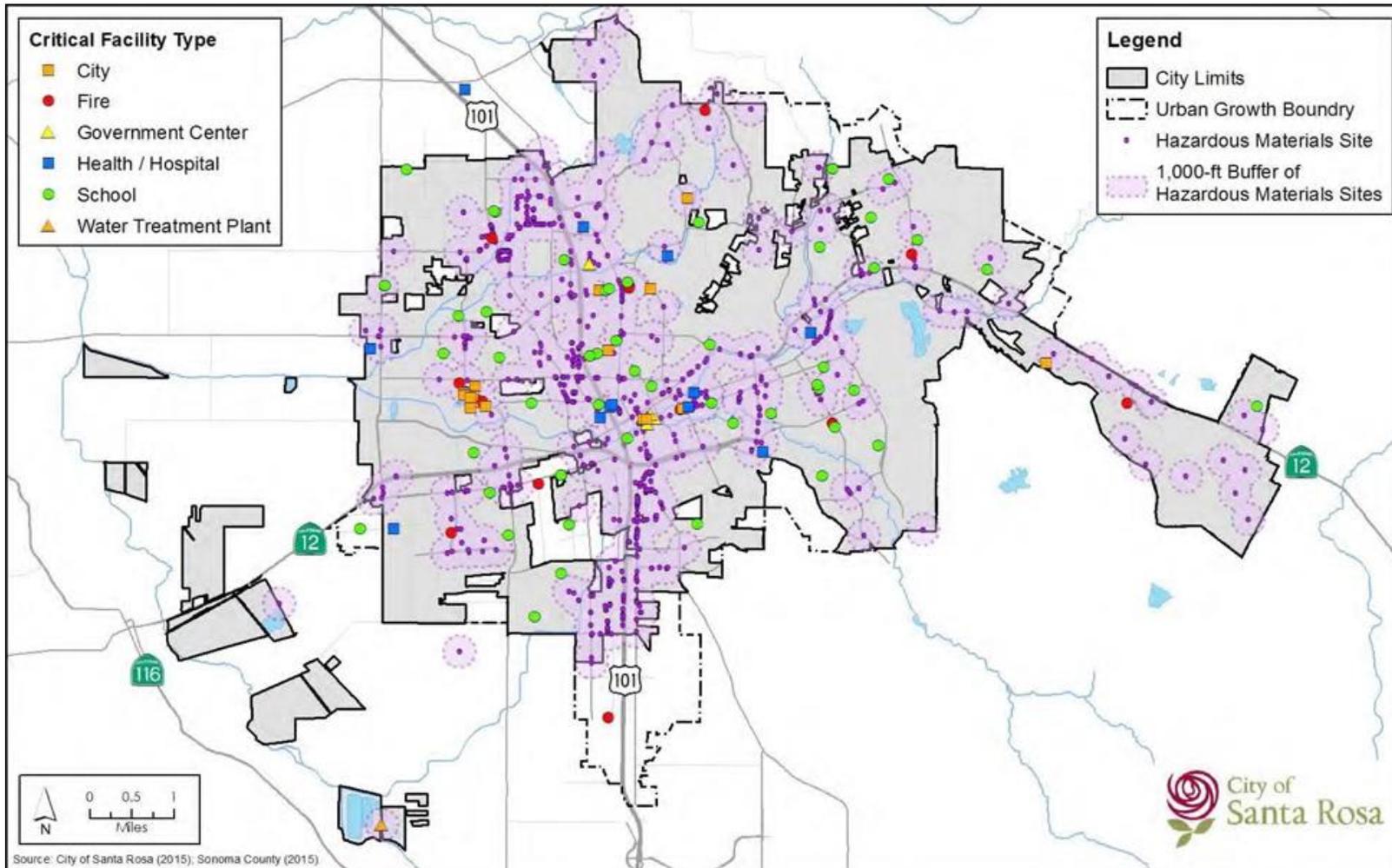
According to the Cal OES, Spill Release Reporting 15 hazardous material spills/accidents have been reported in 2020 (through June). **Figure 7-20** identifies the annual number of reported hazardous material spills within the city from 2010 through June 2020. On average, the City experiences 47.5 reported incidents per year over this 10-year period.

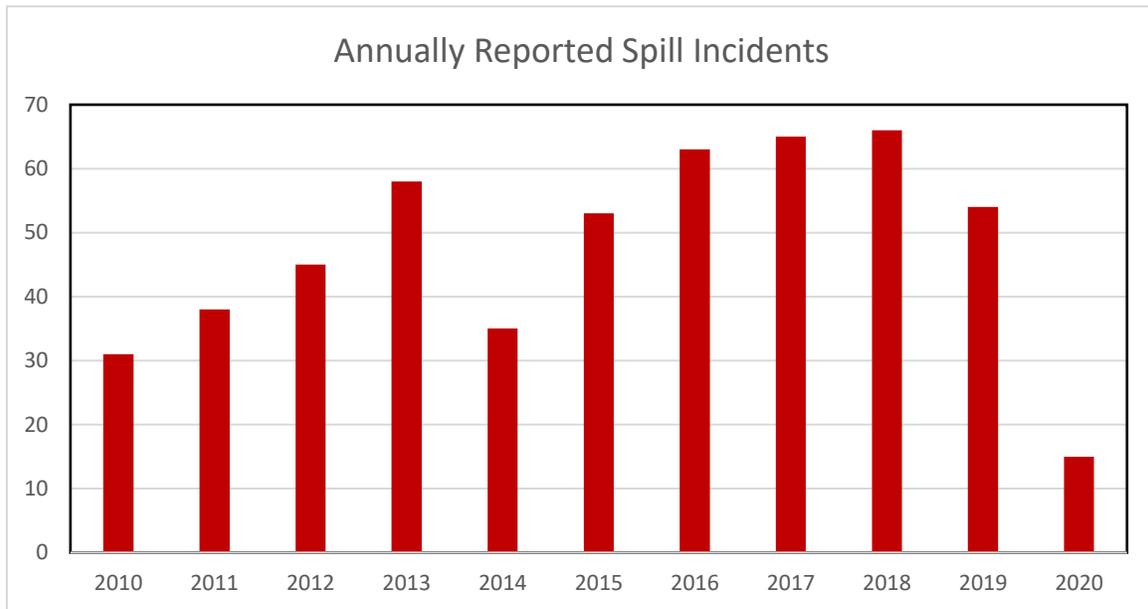
In addition to the hazards described above, there is also a risk from hazardous materials used in building construction, which can be released during renovation or demolition without the use of proper control strategies. Many older buildings and structures may contain lead-based paint, asbestos, and polychlorinated biphenyls (PCBs, materials used in electrical equipment, including fluorescent lighting). While these hazardous materials were banned in new buildings in the 1970s, many buildings in Santa Rosa are old enough to contain these substances.

According to recent data from the US Census Bureau, 31.2 percent of homes in Santa Rosa were constructed before 1970 and potentially included these materials. A significant release of these substances from older buildings is unlikely, but renovation and demolition activities (especially post-disaster) should include steps to reduce exposure to these materials and minimize the chance of being released into the environment.

While climate change is not directly linked to the release of hazardous material, risks that other hazard events (flood, wildfire, etc.) may increase in frequency/intensity could increase the likelihood of accidental hazardous materials release.

Figure 7-19. Identified Hazardous Materials Sites



**Figure 7-20.** Reported Hazardous Materials Spills

## 7.10 AIRPORT HAZARDS

An aircraft incident refers to when an airborne vehicle experiences failure that endangers people on the ground or in the air. This could be from human error, inclement weather, deferred maintenance, design flaw, equipment failure, or, in a worst-case scenario, a collision.

Sonoma County has a total of six airports, the largest of which is the Charles M. Schulz-Sonoma County Airport (Sonoma County Airport). This airport is in central Sonoma County, approximately seven miles northwest of the City of Santa Rosa and 18 miles inland from the Pacific Ocean. The airport is conveniently accessible to most of the County via US Highway 101 (**Figure 7-21**), which is the principal access route to the terminal.

Situated in a broad, flat valley at an elevation of 125 feet above mean sea level, the Sonoma County Airport is surrounded by rural residential and agricultural uses. Over the past two decades, residential, commercial, and industrial uses from Santa Rosa (to the south), Windsor (to the north), and Larkfield-Wikiup area (to the east) have encroached closer to the airport.

**Figure 7-21.** Sonoma County Airport Location

As the only commercial service airport between the San Francisco Bay Area to the south, Sacramento to the east, and Arcata-Eureka to the north, this facility's primary service area has a population of over one million people. This airport is designated as a Primary Commercial Service Non-Hub Airport. The closest other airports of this type are the San Francisco, Oakland, and San Jose International Airports. The airport also serves a growing population of general aviation activities, including corporate and business flights. According to the Airport Master Plan, additional airline service, could expand, allowing new, quiet technology jet aircraft with up to 150 passenger seats. The airport also serves as a base of operations for local pilots, a place to conduct business, and a point of emergency access for the region.

**Table 7-5** identifies the passenger growth by year for Sonoma County Airport from 2014 through April 2020. Based on this information, passenger growth has increased between 4 and 28 percent through 2019. This year's 2020 passenger statistics have been affected by COVID-19 and "stay-at-home" orders and restrictions. These actions have caused a drastic reduction in travel and anticipate a continued reduction in travel until the pandemic subsides.

Table 7-5: Passenger Growth by Year for Charles M. Schulz-Sonoma County Airport				
Year	Passengers In	Passengers Out	Total Passengers In/Out of Airport	Growth Percentage of Passengers In/Out of Airport from Previous Year
2014	118,979	119,341	238,320	4.8% / 4.3%
2015	131,428	131,714	263,142	10.5% / 10.4%
2016	169,224	169,967	339,191	28.8% / 29.0%
2017	197,984	199,803	397,787	17.0% / 17.6%
2018	218,750	221,894	440,644	10.5% / 11.1%
2019	243,501	244,676	488,177	11.3% / 10.3%
Jan–April 2020 During COVID-19 Pandemic	47,659	47,523	95,182	-22.0% / -21.0%

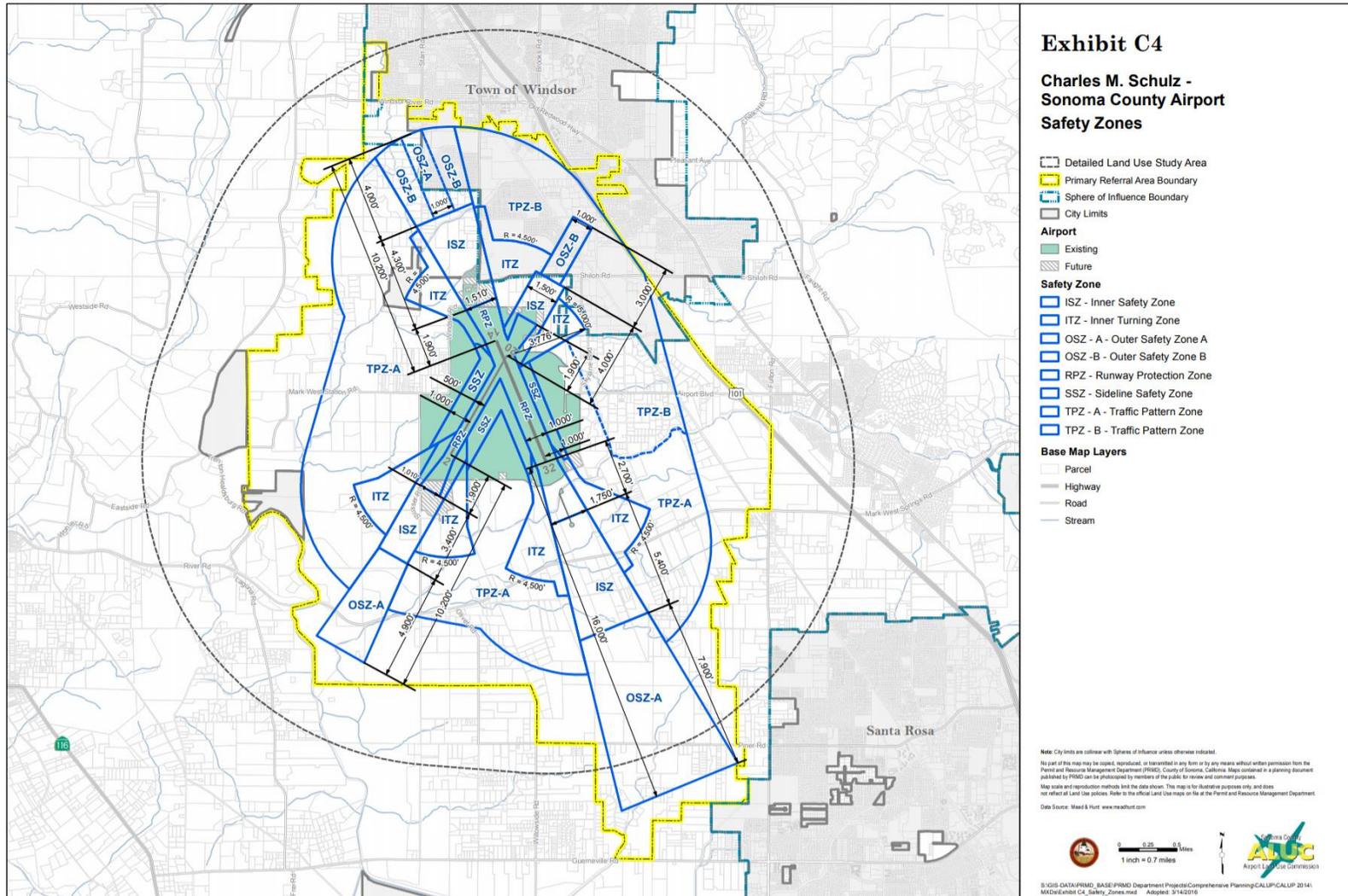
Source: Sonoma County (<https://sonomacountyairport.org/wp-content/uploads/Dec-19-PassengerNumbers-v4.pdf>)

Although Sonoma County Airport is situated in the predominantly agricultural countryside northwest of Santa Rosa, the nature of the airport's activity is such that its area of influence extends many miles from the airport property. **Figure 7-22** identifies the Airport Safety Zones, which identifies the zones that come close to northern Santa Rosa.

According to the National Transportation Safety Board, there have been 37 aircraft incidents/accidents within the City since 1982. Twenty-four of these incidents were from flights originating from Sonoma County Airport, with 13 additional incidents originating from planes from other airports traveling to Sonoma County Airport. Of that total, six of these events resulted in fatalities.

- The most recent event occurred on January 28, 2016, involving a single-engine Piper PA-24 that departed from Palm Springs. While on approach to Sonoma County Airport, the aircraft crashed, killing the pilot and passenger.
- An event that occurred on December 4, 2015, involved an Alaska Airlines aircraft that killed a deer during landing. The aircraft was able to land safely during this incident, with no injuries reported.

Figure 7-22. Sonoma County Airport Safety Zone



## 7.11 EMERGENCY PREPAREDNESS

### What is the City doing to prepare for an emergency?

The City of Santa Rosa is vulnerable to a host of hazards, including earthquakes, floods, winter storms, landslides and mudslides, hazardous material spills, droughts, civil unrest, terrorism, transportation disasters, and pandemics. The following are activities undertaken by the City to support emergency planning and preparedness.

#### Continuity of Operations Plan

A COOP refers to the effort within individual cities, departments, and agencies to ensure a continuance of their essential functions across a wide range of potential emergencies. An organization's resiliency is directly related to the effectiveness of its continuity capability, and the ability of the organization to protect its employees, customers, essential facilities, equipment, records, and other assets; reduce and mitigate disruptions to operations; prevent the loss of life and property damage; timely and orderly recovery from emergencies; and resumption of full service to customers. The City's COOP is designed to ensure the continuity of government and performance of essential functions during and after an emergency, disaster, or other disruption to normal business operations.

#### Emergency Operations Plan

An EOP outlines how the City's government, stakeholder agencies, community-based organizations, business community, and residents coordinate their response to major emergencies and disasters. This plan identifies operational strategies and plans for managing inherently complex and potentially catastrophic events. The EOP is designed to promote flexibility, allowing the City's assets, resources, and departments to use good judgment and common sense when responding to emergency situations.

If the City of Santa Rosa determines the effects of an emergency are or may become, beyond the capability of local resources, a local emergency can be proclaimed. A local proclamation of emergency allows the City Manager and the Director of Emergency Services to take measures necessary to protect and preserve public health and safety and supports requests for State and federal assistance. A proclamation also provides City staff with additional powers and authorities to increase the speed and effectiveness of City response activities. **Figure 7-23** displays the list of departments along with their primary and secondary responsibilities during an emergency event.

Figure 7-23. City Department Emergency Response Function Responsibilities

Function	City Attorney	City Manager	Community Engagement	Finance	Fire	Housing & Community Services	Human Resources	Information Technology	Planning & Economic Development	Police	Recreation & Parks	Transportation & Public Works	Water	City Council & Mayor
Alert & Warning		S			S					P				
Communications					S			P		S				
Situation Analysis		S	S	S	P	S		S	P	P	S	S	S	S
Management	S	P			S					S				
Public Information		P	S		S					S				S
Legal Considerations	P	S												
Fire Suppression					P									
Search & Rescue					P					S			S	
Emergency Medical					P									
Law Enforcement										P				
Movement & Evacuation					S					P		S		
Access Control										P		S		
Care & Shelter						S	S		S		P	S		
Construction & Engineering						S			P		S	P	S	
Supply & Procurement	S	S		P										
Personnel				S			P							
Transportation												P		
Utilities												S	P	
Finance & Administration		S		P										
Damage Assessment					S	S			P		S	S	S	
Debris Clearance		S									S	P	S	
Recovery Planning		P	S	S	S	P	S	S	P	S	S	S	S	S

P = Primary  
S = Secondary

## Emergency Preparedness Activities

The City's emergency preparedness activities focus on improving the ability to coordinate, respond, and effectively recover from a critical incident. These activities also emphasize emergency planning, training, and exercises for City personnel, as well as public education and outreach for businesses and residents.

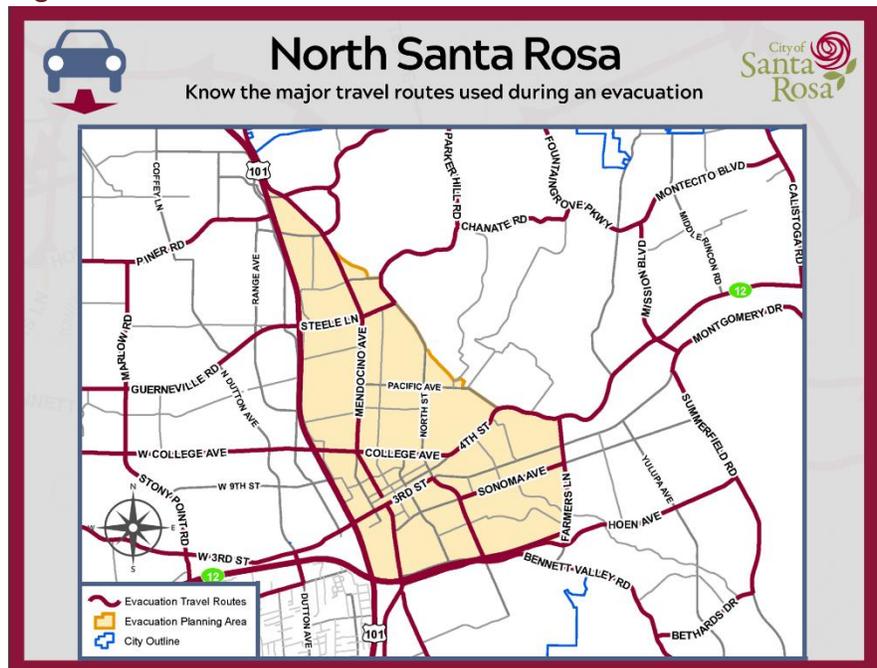
In addition to these activities, the City provides residents and businesses access to several preparedness resources through their Emergency Preparedness webpage located here: <https://srcity.org/2558/Preparedness-Resources>

## Evacuation Routes/Resources

The City has identified evacuation routes throughout Santa Rosa organized by evacuation areas. Easy access to this information is provided through the simple, well-designed website that displays available evacuation routes from an address located within the city. By design, this application allows the home/business owner to create a printable map to keep in their emergency planning kit. In addition to this resource, the City has developed pre-defined evacuation route maps for each evacuation planning area of the City. **Figure 7-24** illustrates the evacuation route map, using Santa Rosa City Hall as the starting address.

When disaster strikes, residents may be asked to evacuate their homes. Depending on the emergency, the safest route out of a neighborhood may not be the typical route a person would take. It is important for community members to know all the ways out of their neighborhoods and to take actions now to be better prepared in the event they must leave their homes. Community members can use the evacuation tools and resources on the City's website to better prepare for an evacuation. Santa Rosa has divided the city into different evacuation planning areas, each area is shown in the City's interactive neighborhood travel routes tool, located here: <https://srcity.org/3374/Neighborhood-Travel-Routes>.

**Figure 7-24.** Evacuation Routes



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